Calys 1000/1200/1500

XXXXX
2 channels high accuracy multifunction calibrators

Mode d'Emploi
Instructions Manual

calys 1000/1200/1500

2 channels high accuracy multifunction calibrators

Mode d'Emploi

Manuel d'instruction NTA 47xxx-xxxA1

LIMITE DE GARANTIE ET LIMITE DE RESPONSABILITÉ

La société AOIP S.A.S garantit l'absence de vices des matériaux à la fabrication de ce produit dans des conditions normales d'utilisation et d'entretien. La période de garantie est d'un an et prend effet à la date d'expédition. Les pièces, les réparations de produit et les services sont garantis pour une période de 90 jours. Cette garantie ne s'applique qu'à l'acheteur d'origine ou à l'utilisateur final s'il est client d'un distributeur agréé par AOIP S.A.S, et ne s'applique pas aux fusibles, aux batteries/piles interchangeables ni à aucun produit qui, de l'avis d'AOIP S.A.S, a été malmené, modifié, négligé ou endommagé par accident ou soumis à des conditions anormales d'utilisation et de manipulation. AOIP S.A.S garantit que le logiciel fonctionnera en grande partie conformément à ses spécifications fonctionnelles pour une période de 90 jours et qu'il a été correctement enregistré sur des supports non défectueux. AOIP S.A.S ne garantit pas que le logiciel ne contient pas d'erreurs ou qu'il fonctionne sans interruption.

Les distributeurs agréés par AOIP S.A.S appliqueront cette garantie à des produits vendus à leurs clients neufs et qui n'ont pas servi, mais ne sont pas autorisés à appliquer une garantie plus étendue ou différente au nom d'AOIP S.A.S. Le support de garantie est offert si le produit a été acquis par l'intermédiaire d'un point de vente agréé par AOIP S.A.S ou bien si l'acheteur a payé le prix international applicable. AOIP S.A.S se réserve le droit de facturer à l'acheteur les frais d'importation des pièces de réparation ou de remplacement si le produit acheté dans un pays a été expédié dans un autre pays pour y être réparé.

L'obligation de garantie d'AOIP S.A.S est limitée, au choix d'AOIP S.A.S, au remboursement du prix d'achat, ou à la réparation /remplacement gratuit d'un produit défectueux retourné dans le délai de garantie à un centre de service agréé par AOIP S.A.S.

Pour avoir recours au service de la garantie, mettez-vous en rapport avec l'agence AOIP S.A.S la plus proche ou envoyez le produit, accompagné d'une description du problème, port et assurance payés (franco lieu de destination), au centre de service agréé par AOIP S.A.S le plus proche. AOIP S.A.S dégage toute responsabilité en cas de dégradations survenues au cours du transport. Après la réparation sous garantie, le produit sera retourné à l'acheteur, frais de port payés d'avance (franco lieu de destination). Si AOIP S.A.S estime que le problème a été causé par un traitement abusif, une modification, un accident ou des conditions de fonctionnement ou de manipulation anormales, AOIP S.A.S fournira un devis des frais de réparation et ne commencera la réparation qu'après en avoir reçu l'autorisation. Après la réparation, le produit sera retourné à l'acheteur, frais de port payés d'avance, et les frais de réparation et de transport lui seront facturés.

LA PRÉSENTE GARANTIE EST EXCLUSIVE ET TIENT LIEU DE TOUTES AUTRES GARANTIES, EXPLICITES OU IMPLICITES, Y COMPRIS, MAIS NON EXCLUSIVEMENT, TOUTE GARANTIE IMPLICITE QUANT A L'APTITUDE DU PRODUIT A ÊTRE COMMERCIALISE OU A ETRE APPLIQUE A UNE FIN OU A UN USAGE DETERMINE. AOIP S.A.S NE POURRA ÊTRE TENU RESPONSABLE D'AUCUN DOMMAGE PARTICULIER, INDIRECT, ACCIDENTEL OU CONSECUTIF, NI D'AUCUNS DÉGÂTS OU PERTES DE DONNEES, QUE CE SOIT A LA SUITE D'UNE INFRACTION AUX OBLIGATIONS DE GARANTIE, SUR UNE BASE CONTRACTUELLE, EXTRA-CONTRACTUELLE OU AUTRE.

Étant donné que certains pays ou états n'admettent pas les limitations d'une condition de garantie implicite, ou l'exclusion ou la limitation de dégâts accidentels ou consécutifs, les limitations et les exclusions de cette garantie pourraient ne pas s'appliquer à chaque acheteur. Si une disposition quelconque de cette garantie est jugée non valide ou inapplicable par un tribunal compétent, une telle décision n'affectera en rien la validité ou le caractère exécutoire de toute autre disposition.

Table des matières

CALYS 1000/1200/1500 ..... **1**

CALYS 1000/1200/1500 ..... **3**

A. PRESENTATION **6**

A.1 CARACTERISTIQUES GENERALES 6
A.1.1 Spécifications de mesure-simulation *7*

B. CARACTERISTIQUES GENERALES **9**

B.1 POSSIBILITES D'ENTREE / SORTIE 9
B.2 CLAVIER 9
B.3 AFFICHEUR 9
B.4 INTERFACE NUMERIQUE 9
B.5 PROGRAMME 9
B.6 FACTEUR D'ECHELLE 9
B.7 MESURES MOYENNES 9
B.8 FREQUENCE - IMPULSION 9
B.9 SONDE DE TEMPERATURE RACCORDABLE 9
B.10 ALIMENTATION 10
B.11 PROGRAMMES EN SIMULATION 10

C. PRESENTATION PHYSIQUE **11**

D. PRESENTATION DES FONCTIONS **12**

D.1 ALIMENTATION 12
D.2 PRESENTATION DU CLAVIER 12
D.3 CIRCUIT DE MESURE 13
D.4 MICROPROCESSEUR 13
D.5 PROGRAMME SPECIFIQUE 13
D.6 AFFICHEUR 13
D.7 CONVERTISSEUR NUMERIQUE ANALOGIQUE (A/N) 14
D.8 CHARGEUR DE BATTERIE ET ALIMENTATION RESEAU 14
D.9 INTERFACE NUMERIQUE 14
D.10 MESURE DE RESISTANCE ET DE SONDE A RESISTANCE 14
D.11 SIMULATION DE RESISTANCE ET DE THERMOSONDE 14
D.12 CIRCUIT ENTREE/SORTIE POUR THERMOCOUPLES 15

E. VERIFICATION ET INSTALLATION **16**

E.1 DEBALLAGE 16
E.2 BOITIER 16
E.2.1 Valise de protection *16*
E.2.2 Montage en tableau *16*
E.2.3 Utilisation sur table *16*

F. ALIMENTATION **17**

F.1 ALIMENTATION - BATTERIES RECHARGEABLES 17
F.1.1 Charge des batteries *17*
F.1.2 Comment optimiser l'utilisation des batteries *17*
F.2 RACCORDEMENT DES THERMOCOUPLES 18

G. UTILISATION ET APPLICATIONS **19**

G.1 MISE EN MARCHE 19
G.2 DATE DU PROCHAIN ETALONNAGE 19
G.3 TOUCHE "HELP" 19
G.4 CONFIGURATION GENERALE 19
G.5 REGLAGE DE LA CONFIGURATION GENERALE 20
G.6 SELECTION MODE MESURE / SIMULATION (IN/OUT 21
G.7 POSITION DU POINT DECIMAL 21
G.8 MODE FILTRATION (AVERAGE) 21
G.9 FONCTION DE MAINTIEN, DE CABLAGE DE LA PT100 POUR COMPENSATION DE SOUDURE FROIDE EXTERNE 21
G.10 SELECTION DU PARAMETRE OU DU CAPTEUR 22
G.11 FACTEUR D'ECHELLE MODE SET UP 22
G.12 MODES °C, °F, RJ ET CONFIGURATION EIT (ITS : INTERNATIONAL TEMPERATURE SCALE) 22
G.13 SELECTION RAPIDE DU MODE RJ 23
G.14 MEMOIRES ENTREES/SORTIES 23
G.15 PROGRAMME DE SCRUTATION AUTOMATIQUE 23
G.16 PROGRAMME DE RAMPE 24
G.17 REGLAGE DU MODE TARE (OFFSET) 25

H. OPTIONS ET ACCESSOIRES **27**

H.1 IMPRIMANTE EXTERNE (OPTION) 27
H.1.1 Recommandations générales *27*
H.1.2 Fonctionnement de l'imprimante *27*
H.2 FONCTION DATA LOGGING 27

I. INTERFACE DIGITALE **29**

I.1 PROTOCOLE DE COMMUNICATION DU MICROCAL 200 A UN PC 29

J. MAINTENANCE **30**

J.1 RECOMMANDATIONS 30
J.2 STOCKAGE 30
J.3 MESSAGE D'ERREURS 30
J.4 REMPLACEMENT DES FUSIBLES 30
J.5 PROTOCOLE DE COMMUNICATION CALYS 1XXX ←→PC 31

A. PRESENTATION

Les calibrateurs Calys1000/1200/1500 sont des instruments multifonctions avec 2 voies isolées et indépendantes, construit pour répondre de façon moderne et pratique aux besoins des ingénieurs Instrumentistes aussi bien en laboratoire que sur le terrain.

Précis, compact, robuste, facile à utiliser, la solution Idéale pour simuler sur la voie 1 (Out) et mesurer sur la voie 2 (In) :

- millivolts
- volts
- milliampères (boucle active et boucle passive)
- ohms
- températures avec thermocouples
- températures avec sondes à résistance
- fréquence
- impulsions

Des entrées sont disponibles en option pour la mesure de température et d'humidité relative (la sonde de température est branchée sur la même entrée que la sonde externe de mesure de soudure froide).

La conception modulaire comporte les algorithmes de linéarisation des thermocouples et des thermomètres à résistance en accord avec les normes CEI, DIN et JIS standard pour les échelles de température IPTS 68 et EIT 90.

La simulation - mesure de résistance et de température avec sonde à résistance - utilise un circuit actif spécial breveté.

Un système de compensation automatique de soudure froide (référence Jonction Rj) permet au « calys 1xxx » de donner des valeurs précises, en entrée et sortie, en opérant dans des conditions de température de -10°C à +50°C. De plus une compensation externe est réglable pour les températures de -50°C à +100°C, et une sonde Pt100 peut se raccorder pour une mesure à distance de -10°C à +100°C.

Le menu permet la génération de vingt valeurs mémorisées ou des pas de rampes ou des cycles de valeurs.

Une alimentation stabilisée et isolée programmable de 3 Vdc à 28 Vdc permet la connexion directe de convertisseurs ou de transmetteurs en 2 ou 4 fils.

L'Instrument est alimenté par 4 batteries NiCd rechargeables. L'alimentation externe est universelle pour une tension d'alimentation de 86 à 264 Vac.

A.1 Caractéristiques générales

- Paramètres entrée/sortie :
  - mV, V, mA, Q, kΩ, fréquence, impulsion
  - Thermocouples type : J,K,T,R,S,B,N,C,E,U,L,F,G,D
  - Sonde à résistance : Pt100 suivant normes IEC, OIML, USLAB, US, SAMA, JIS Pt200, 500, 1000, 1000 OIML Ni100, Ni120, Cu10, Cu100
- Compensation de jonction de référence (soudure froide) Rj :
  - interne et automatique de -10°C à +50°C avec une sonde Pt100 . externe ajustable en manuel de -50°C à +100°C . à distance par Pt100 externe de -10°C à +100°C
- Dérive de compensation Rj : ±0,015°C/°C de -10°C à +55°C
- Réjection en mode commun > 140 dB en fonctionnement courant alternatif
- Réjection en mode normal > 70 dB à 50 ou 60 Hz
- Stabilité de température :
  - pleine échelle : ±8 ppm / °C . zéro : ±0,2 uV/°C
- Impédance de sortie (fem. de sortie) moins de 0,5 Ω avec un courant maximum de 0,5 mA
- Impédance d'entrée > 10 MΩ
- Effets de la résistance de la source : ±1 uV d'erreur pour 1000 Ω de résistance de la source
- Courant de simulation de Rtd et Ω de 0,2 à 5 mA
- Courant de mesure de Rtd et Ω 0,4 mA ; raccordement 2 - 3 ou 4 fils en Rtd
- Câble de compensation de Rtd jusqu'à 100 Ω par fil
- Erreur due au câble pour Pt100 : ±0,005°C/n pour le fil entier
- Résistance de shunt (calibre mA) < 50 Ω
- Résistance de charge maximale 1000 Ω à 20 mA
- Afficheur : écran LCD 128 x 64 points avec rétro-éclairage
- Temps d'échantillonnage des mesures : 250 ms
- Bruit en sortie (à 300 Hz) :
  - < 2 uV crête à crête pour les calibres jusqu'à 100 mV
  - < 50 uV crête à crête pour les calibres jusqu'à 10 V
- Interface digitale : RS232 bidirectionnelle
- Isolation entre la voie 1 et la voie 2 = 500 Vcc
- Fonctions de calcul : maintien, max, min, offset, moyenne
- Mode simulation : Choix par incrément de digit, entrée numérique, valeur stockée en mémoire, incrément, autorampe, autoscrutation, cycle automatique
- Sélection °C/°F/K directe par le clavier
- Banque de mémoire : 20 valeurs de simulation avec rappel manuel ou automatique
- Fonction data logger (scrutateur) > 1500 valeurs
- Fonction de conversion : affiche l'équivalent de l'unité en valeur électrique (unité « engineering » ou « procédé »)
- Facteur d'échelle : zéro et gain programmables de -399999 à +999999
- Racine carrée : en combinaison avec le facteur d'échelle
- Etalonnage : auto-étalonnage avec procédure automatique
- Alimentation : batteries rechargeables NiCd
- Autonomie : 6 h en entrée ou en sortie Te et mV (rétro-éclairage éteint)
  - 3,5 h en simulation 20 mA (rétro-éclairé éteint))
- Temps de charge : 4 h à 90 % et 6 h à 99 % , appareil éteint
- Indication de charge : sur l'afficheur LCD par bargraphe
- Alimentation : 100V -120 V - 220 V - 240 Vac ±10 % à l'aide d'un chargeur externe

- Isolement alimentation : 2500 Vac
- Identification du programme : affichage de la révision sur l'afficheur
- Température de fonctionnement : de -10°C à +55°C
- Température de stockage de -30°C à +60°C
- Boîtier ABS injecté avec revêtement métallique anti-rayonnements
- Dimensions : 264 x 96 x 172 mm (norme DIN)
- Poids net 4 kg - Poids brut 5,5 kg

A.1.1 Spécifications de mesure-simulation

MESURE – SIMULATION

				CALYS 1200	Calys 1000
Calibres	**Plage Max.**	**Plage spécifiée**	**Résolution**	**Précision (% de la lecture)**	**Précision (% de la lecture)**
Tc type J	-210 à 1200°C	-190 à 1200°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-350 à 2200°F	-310 à 2192°F	0.1°F	±(0.01% +0.18F)	± (0.02% +0.18 °F)
Tc type K	-270 à 1370°C	-160 à 1260°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	454 à 2500°F	-256 à 2300°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type T	-270 à 400°C	-130 à 400°C	0.01°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-454 à 760°F	-238 à 752°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type R	-50 à 1760°C	150 à 1760°C	0.1°C	±(0.01% +0.2°C)	± (0.02% +0.2 °C)
	-60 à 3200°F	302 à 3200°F	0.1°F	±(0.01% +0.36°F)	± (0.02% +0.36 °F)
Tc type S	-50 à 1760°C	170 à 1760°C	0.1°C	±(0.01% +0.2°C)	± (0.02% +0.2 °C)
	-60 à 3200°F	338 à 3200°F	0.1°F	±(0.01% +0.36°F)	± (0.02% +0.36 °F)
Tc type B	50 à 1820°C	920 à 1820°C	0.1°C	±(0.01% +0.3°C)	± (0.02% +0.3 °C)
	140 à 3310°F	1688 à 3308°F	0.1°F	±(0.01% +0.54°F)	± (0.02% +0.54 °F)
Tc type C	0 à 2300°C	0 à 2000°C	0.1°C	±(0.01% +0.2°C)	± (0.02% +0.2 °C)
	32 à 4180°F	32 à 3632°F	0.1°F	±(0.01% +0.36°F)	± (0.02% +0.36 °F)
Tc type G	0 à 2300°C	190 à 2300°C	0.1°C	±(0.01% +0.3°C)	± (0.02% +0.3 °C)
	32 à 4180°F	374 à 4172°F	0.1°F	±(0.01% +0.54°F)	± (0.02% +0.54 °F)
Tc type D	0 à 2300°C	0 à 2130°C	0.1°C	±(0.01% +0.3°C)	± (0.02% +0.3 °C)
	32 à 4180°F	32 à 3866°F	0.1°F	±(0.01% +0.54°F)	± (0.02% +0.54 °F)
Tc type U	-200 à 400°C	-160 à 400°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-330 à 760°F	-256 à 752°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type L	-200 à 760°C	-200 à 760°C	0.1°C	±(0.01% +0.1°C)	± (0.02% + 0.1 °C)
	-330 à 1400°F	-328 à 1400°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type N	-270 à 1300°C	0 à 1300°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-450 à 2380°F	32 à 2372°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type E	-270 à 1000°C	-200 à 1000°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-454 à 1840°F	-328 à 1832°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type F	0 à 1400°C	0 à 1400°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	32 à 2560°F	32 à 2552°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Pt100 IEC	-200 à 850°C	-200 à 850°C	0.01°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
OIML, 3926	-330 à 1570°F	-328 à 1562 °F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Pt100	-200 à 650°C	-200 à 650°C	0.01°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
a 3902	-330 à 1210°F	-328 à 1210°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Pt100 JIS	-200 à 600°C	-200 à 600°C	0.01°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
SAMA	-330 à 1120°F	-328 à 1112°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Pt 200	-200 à 850°C	-200 à 850°C	0.1°C	±(0.01% +0.15°C)	± (0.02% +0.15 °C)
	-330 à 1570°F	-328 à 1562°F	0.1°F	±(0.01% +0.27°F)	± (0.02% +0.27 °F)
Pt 500	-200 à 850°C	-200 à 530°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-330 à 1570°F	-328 à 986°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Pt1000 IEC	-200 à 850°C	-200 à 850°C	0.01°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
OIML	-330 à 1570°F	-328 à 1562°F	0.1°F	±(0.01% +0.18°F)	± (0.02 % +0.18 °F)
CU10	-70 à 150°C	-70 à 150°C	0.1°C	±(0.01% +0.4°C)	± (0.02% +0.4 °C)
	-100 à 310°F	-94 à 302°F	0.1°F	±(0.01% +0.72°F)	± (0.02% +0.72 °F)
CU100	-180 à 150°C	-180 à 150°C	0.1°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
	-300 à 310°F	-292 à 302°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Ni100	-60 à 180°C	-60 à 180°C	0.1°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
	-80 à 360°F	-76 à 356°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Ni120	0 à 150°C	0 à 150°C	0.1°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
	32 à 310°F	32 à 302°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
mV		-20 à +200mV	1µV	±(0.01% +2µV)	± (0.02% +2 µV)
mV		-0.2 à +2 V	10 µV	±(0.01% +10 µV	± (0.02% +10 µV)
V		-2 à +20 V	0.1mV	±(0.01% +0.08mV)	± (0.02% +0.08 mV)
mA (In)		-5 à +50mA	0.1µA	±(0.01% +0.4µA)	± (0.02% +0.4 µA)
mA (Out)		0 à +50mA	0.1µA	±(0.01% +0.4µA)	± (0.02% +0.4 µA)
Ω IN		0 à 500Ω	1mΩ	±(0.01% +12mΩ)	± 0.02% +12 mΩ)
		0 à 5000 Ω	0.01Ω	±(0.01% +120mΩ)	± (0.02% +120 mΩ)
Ω OUT		0 à 500 Ω	1 mΩ	±(0.01% +20mΩ)	± (0.02% +20 mΩ)
		0 à 5000 Ω	0.01Ω	±(0.01% +200mΩ)	± (0.02% +200 mΩ)
Fréquence		1 à 200 Hz	0.001 Hz	±(0.005% +0.001 Hz)	
		1 à 2000 Hz	0.01	±(0.005% +0.001 Hz)	
		1 à 20000 Hz	0.1 Hz	±(0.005% +0.001 Hz)	
Impulsions mesure		0 à 10^6 counts	1 impulsion	infinie	
Impulsions émission		0 à 6000 pulse/min	1 impulsion /min	1 impulsion /min	
		0 à 36000 pulse/h	1 impulsion /h	1 impulsion / min	

Remarques:
- Exactitude :1 an suivant les conditions d'utilisation de +18°C à +28°C
- Exactitude typique sur 90 jours en divisant la valeur % L par 1,6
- Exactitude typique sur 2 ans en multipliant la valeur % L par 1,4.
- Rajouter sur tous les calibres ±1 digit d'erreur

				CALYS 1500
Calibres	**Plage Max.**	**Plage spécifiée**	**Résolution**	**Précision (% de la lecture)**
Tc type J	-210 à 1200°C	-190 à 1200°C	0.01°C	±(0.005%+0.1°C)
	-350 à 2200°F	-310 à 2192°F	0.1°F	±(0.005%+0.18F)
Tc type K	-270 à 1370°C	-160 à 1260°C	0.01°C	±(0.005%+0.1°C)
	454 à 2500°F	-256 à 2300°F	0.1°F	±(0.005% +0.18°F)
Tc type T	-270 à 400°C	-130 à 400°C	0.01°C	±(0.005%+0.1°C)

	-454 à 760°F	-238 à 752°F	0.1°F	±(0.005%+0.18°F)
Tc type R	-50 à 1760°C	150 à 1760°C	0.01°C	±(0.005%+0.2°C)
	-60 à 3200°F	302 à 3200°F	0.1°F	±(0.005%+0.36°F)
Tc type S	-50 à 1760°C	170 à 1760°C	0.01°C	±(0.005%+0.2°C)
	-60 à 3200°F	338 à 3200°F	0.1°F	±(0.005%+0.36°F)
Tc type B	50 à 1820°C	920 à 1820°C	0.01°C	±(0.01%+0.3°C)
	140 à 3310°F	1688 à 3308°F	0.1°F	±(0.01%+0.54°F)
Tc type C	0 à 2300°C	0 à 2000°C	0.1°C	±(0.01%+0.2°C)
	32 à 4172°F	32 à 3632°F	0.1°F	±(0.01%+0.36°F)
Tc type G	0 à 2300°C	190 à 2300°C	0.1°C	±(0.01%+0.3°C)
	32 à 4172°F	374 à 4172°F	0.1°F	±(0.01%+0.54°F)
Tc type D	0 à 2300°C	0 à 2130°C	0.1°C	±(0.01%+0.3°C)
	32 à 4172°F	32 à 3866°F	0.1°F	±(0.01%+0.54°F)
Tc type U	-200 à 400°C	-160 à 400°C	0.01°C	±(0.005%+0.1°C)
	-330 à 760°F	-256 à 752°F	0.1°F	±(0.005%+0.18°F)
Tc type L	-200 à 760°C	-200 à 760°C	0.01°C	±(0.005%+0.1°C)
	-330 à 1400°F	-328 à 1400°F	0.1°F	±(0.005%+0.18°F)
Tc type N	-270 à 1300°C	0 à 1300°C	0.01°C	±(0. 005%+0.1°C)
	-450 à 2380°F	32 à 2372°F	0.1°F	±(0. 005%+0.18°F)
Tc type E	-270 à 1000°C	-200 à 1000°C	0.01°C	±(0. 005%+0.1°C)
	-454 à 1840°F	-328 à 1832°F	0.1°F	±(0. 005%+0.18°F)
Tc type F	0 à 1400°C	0 à 1400°C	0.01°C	±(0. 005%+0.1°C)
	32 à 2560°F	32 à 2552°F	0.1°F	±(0. 005%+0.18°F)
Pt100 IEC	-200 à 850°C	-200 à 850°C	0.01°C	±(0.005%+0.05°C)
OIML, 3926	-330 à 1570°F	-328 à 1562 °F	0.1°F	±(0.005%+0.09°F)
Pt100	-200 à 650°C	-200 à 650°C	0.01°C	±(0.005%+0.05°C)
a 3902	-330 à 1210°F	-328 à 1210°F	0.1°F	±(0.005%+0.09°F)
Pt100 JIS	-200 à 600°C	-200 à 600°C	0.01°C	±(0. 005%+0.05°C)
SAMA	-330 à 1120°F	-328 à 1112°F	0.1°F	±(0. 005%+0.09°F)
Pt 200	-200 à 850°C	-200 à 850°C	0.01°C	±(0.005%+0.15°C)
	-330 à 1570°F	-328 à 1562°F	0.1°F	±(0.005%+0.27°F)
Pt 500	-200 à 850°C	-200 à 530°C	0.01°C	±(0.005%+0.1°C)
	-330 à 1570°F	-328 à 986°F	0.1°F	±(0.005%+0.18°F)
Pt1000 IEC	-200 à 850°C	-200 à 850°C	0.01°C	±(0.005%+0.1°C)
OIML	-330 à 1570°F	-328 à 1562°F	0.1°F	±(0.005%+0.18°F)
CU10	-70 à 150°C	-70 à 150°C	0.1°C	±(0.01%+0.4°C)
	-100 à 310°F	-94 à 302°F	0.1°F	±(0.01%+0.72°F)
CU100	-180 à 150°C	-180 à 150°C	0.1°C	±(0.01%+0.05°C)
	-300 à 310°F	-292 à 302°F	0.1°F	±(0.01%+0.09°F)
Ni100	-60 à 180°C	-60 à 180°C	0.1°C	±(0.01%+0.05°C)
	-80 à 360°F	-76 à 356°F	0.1°F	±(0.01%+0.09°F)
Ni120	0 à 150°C	0 à 150°C	0.1°C	±(0.01%+0.05°C)
	32 à 310°F	32 à 302°F	0.1°F	±(0.01% +0.09°F)
mV		-20 à +200mV	0.1µV	±(0.0035% +1µV)
mV		-0.2 à +2 V	1 µV	±(0.005%+10 µV
V		-2 à +20 V	10mV	±(0.005%+0.08mV)
mA (In)		-5 à +50mA	0.1µA	±(0.005%+0.4µA)
mA (Out)		0 à +50mA	0.1µA	±(0.005%+0.4µA)
Ω IN		0 à 500 Ω	1mΩ	±(0.005%+12mΩ)
		0 à 5000 Ω	0.01Ω	±(0.005%+120mΩ)
Ω OUT		0 à 500 Ω	1 mΩ	±(0.005%+12mΩ)
		0 à 5000 Ω	0.01Ω	±(0.005%+120mΩ)
Fréquence		1 à 200 Hz	0.001 Hz	±(0.005% +0.001Hz)
		1 à 2 Hz	0.01	±(0.005% +0.001Hz)
		1 à 20 Hz	0.1 Hz	±(0.005% +0.001Hz)
Impulsions mesure		0 à 10^6 counts	1 impulsion	infinie
Impulsions émission		0 à 6000 pulse/min	1 impulsion /min	1 impulsion /min
		0 à 36000 pulse/h	1 impulsion /h	1 impulsion / min

Remarques:

- Exactitude :1 an suivant les conditions d'utilisation de +18°C à +28°C
- Exactitude typique sur 90 jours en divisant la valeur % L par 1,6
- Exactitude typique sur 2 ans en multipliant la valeur % L par 1,4.
- Rajouter sur tous les calibres ±1 digit d'erreur

B. CARACTERISTIQUES GENERALES

B.1 Possibilités d'entrée / sortie

L'ajustement d'une valeur est simplifié par une séquence du menu. On utilise simplement les fonctions « Select » et « Enter ».

Un manuel d'instructions complet est stocké en mémoire et toute information relative à une page de menu peut être obtenue par la touche « Help ».

Les connexions en 2, 3 ou 4 fils en Rtd des voies 1 et 2 sont séparées.

B.2 Clavier

Le clavier est une membrane en polycarbonate thermoformée protégeant l'électronique interne de l'environnement avec une durée de vie d'un million d'opérations par touche.

La sélection d'une valeur de simulation peut être réalisée digit par digit ou par saisie de la valeur numérique.

La fermeture d'un contact (touche) est reconnue comme un signal codé par le microprocesseur.

B.3 Afficheur

Afficheur LCD à haut contraste rétro-éclairé permettant l'utilisation en faible lumière. Sont affichées simultanément la valeur mesurée et la valeur simulée (grands caractères) ainsi qu'une quantité de messages relatifs à la compréhension tels que l'unité, le type de capteur ou de signal, l'échelle de température, le mode de compensation de soudure froide ainsi que le niveau de charge de la batterie (barre graphe).

B.4 Interface numérique

Une interface RS232 bidirectionnelle est disponible en standard pour communiquer avec des ordinateurs.

Un connecteur DIN 9 broches est situé à l'arrière de l'appareil.

B.5 Programme

Il permet :

- la multiplication des modes de génération et de mesure
- le traitement des signaux : filtre, moyenne, maximum, minimum, alarmes
- la mémorisation de procédures de test
- l'acquisition de données
- un programme de test
- la linéarisation des capteurs standards
- la linéarisation de sondes spécifiques

B.6 Facteur d'échelle

C'est une procédure simple permettant de mesurer et de simuler des signaux électriques convertis en unité procédé.

Quatre caractères alphanumériques sont disponibles pour afficher le symbole de cette unité (mbar, %RH, %CO, etc.)

Compensation de soudure froide

Celle-ci est obtenue par une sonde Pt100 Incorporée dans une borne de connexion. Cette température est visualisée sur l'écran.

B.7 Mesures moyennes

Pour la mesure de signaux instables, un calcul de moyenne est réalisé par un nombre programmable d'échantillons ainsi qu'une fonction filtre numérique.

Les valeurs externes et d'alarmes peuvent être calculées ainsi que des fonctions mathématiques.

Simulation et étalonnage de transmetteurs en mode actif ou passif

Les calys 1xxxx peuvent simuler des transmetteurs 4-20 mA. En mode source, il simule 20 mA sur une charge de 1000 ohms.

Pour le contrôle rapide de boucle, on peut mémoriser des valeurs telles que 4, 8, 12, 16 et 20 mA ou l'équivalent en %, en lisant directement le pourcentage d'erreur (en mesure ou en simulation). L'opérateur peut modifier les valeurs en température et générer directement des mA.

B.8 Fréquence - Impulsion

Sur la voie simulation, on génère des signaux carré d'amplitude variable jusqu'à une fréquence de 50 Khz.

Un nombre prédéfini d'impulsions peuvent être programmées et transmises pour tester ou ajuster des totalisateurs et des compteurs.

Sur la voie fréquence, on peut mesurer des impulsions de comptage (de totaux). Les unités sont en Hz, impulsions/h et impulsions/min.

Convertisseur de signaux programmables

Tout signal d'entrée (également sur les ports auxiliaires) peut être converti en signaux d'émission en maintenant l'isolation galvanique.

Raccordement pour sonde à résistance 4 fils

Le raccordement pour sonde de mesure à résistance peut se faire en 2 - 3 ou 4 fils. En 4 fils, la résolution est de 0,01 °C.

B.9 Sonde de température raccordable

Une sonde de précision peut être raccordée au calibrateur pour constituer une chaîne de mesure de précision. Celle-ci peut servir pour la compensation de soudure froide.

B.10 Alimentation

La batterie interne se recharge par un chargeur extérieur. Le calibrateur fonctionne normalement en charge.

B.11 Programmes en simulation

Configuration par menu pour générer :

- une rampe continue ou en pas à pas où le temps total, le point de départ, le point final (la taille des pas est requise pour exécution de la rampe) sont définies par programme (rampe avec des temps différents pour la montée, la stabilisation et la descente)
- un programme de cycles continus : rise, soak, fall
- une incrémentation manuelle par le clavier
- une exécution automatique de 20 valeurs maximum stockées (2 groupes de 10 mémoires).

C. PRESENTATION PHYSIQUE

Les calibrateurs « calys 1xxx» sont constitués d'un boîtier compact et robuste, d'une carte mère avec toutes les fonctions de base, d'un clavier tactile à membrane en polycarbonate, d'un afficheur LCD et d'un bloc de 4 batteries rechargeables NiCd.

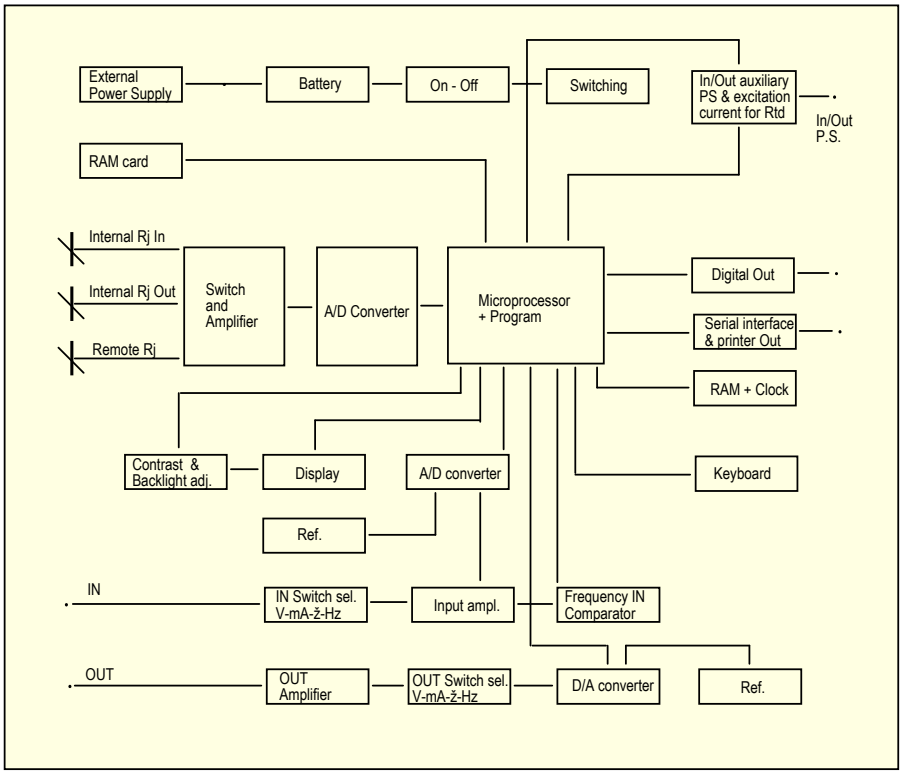
La surface interne du boîtier est métallisée par un procédé spécial de vaporisation pour réduire les effets du bruit électromagnétique.

Les batteries sont logées dans la partie haute du boîtier et sont accessibles par une plaquette clipsée.

Les deux moitiés du boîtier sont assemblées par cinq vis en métal accessibles par l'arrière du boîtier. La sacoche en cuir avec sa bandoulière assure une meilleure protection de l'appareil contre les chocs.

D. PRESENTATION DES FONCTIONS

Diagramme fonctionnel de l'appareil est présenté ci après.



Fonctions de l'appareil :

- Alimentation
- Microprocesseur (unité centrale et programme)
- Circuit d'entrée
- Compensations de soudure froide (Rj)
- Afficheur LCD
- Clavier
- Convertisseur numérique/analogique
- Convertisseur analogique/numérique
- Alimentation auxiliaire
- RAM + horloge (en option)
- Carte RAM (en option)

D.1 Alimentation

L'appareil est alimenté par 4 accumulateurs NiCd.

La batterie est chargée par un module d'alimentation externe.

Si nécessaire, l'appareil peut être alimenté directement sans enlever les batteries.

L'action sur la touche « ON » délivre, pour les circuits de l'appareil, les niveaux de tensions suivants En mesure IN

- +24V circuit analogique
- +5V circuit digital / analogique
- -10V circuit analogique En simulation PUT
- +24V circuit analogique
- +5V circuit digital / analogique
- -5V circuit analogique
- -10V circuit analogique

La séparation galvanique voie 1 / voie 2 (>250 Vac) est assurée par la présence de 2 groupes de sources de tension.

D.2 Présentation du clavier

Le clavier tactile en polycarbonate thermoformé possède une durée de vie d'un million de pressions par touche.

Le contact sur une touche du clavier est reconnu comme un signal codé par le microprocesseur qui l'associe aux instructions de l'opérateur.

La présentation est simplifiée par la réduction du nombre de touches.

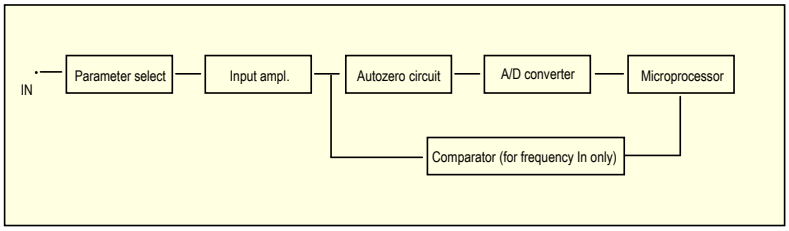
Les différentes fonctions sont les suivantes :

- 1. Borne entrée
- 2. Bornes de sortie
- « ON » = Marche
- « OFF » = Arrêt
- « STO » = Stockage en mémoire
- « RCL » = Rappel mémoire
- ← → Paramètre recherché pendant la sélection ou position du point décimal
- «0...9» Simple digit, entrée numérique, paramètre recherché pendant la sélection et mémoires entrée/sortie
- « SELECT » = Sélection sur le menu actif
- « ± » Polarité du point de simulation
- « , » Position du point décimal en simulation
- « IN/OUT » = Sélection de fonction Entrée/Sortie
- « MENU » = Menu sélection de la configuration instrument
- « ENTER » = Charge de la mémoire - Validation
- « SHIFT » = Fonction secondaire de la touche
- « STATUS » = Pour visionner les pages du mode opérationnel actuel
- « HELP » = Pages de menu suivant Instructions de l'opérateur
- « NUM » = Entrée numérique directe de la valeur à simuler
- « LAMP » = Rétro-éclairage
- « RAMP » = Départ du programme de simulation de rampe.
- ← → = Sélection de l'affichage de l'entrée et de la sortie

D.3 Circuit de mesure

L'erreur de non linéarité du convertisseur est inférieure à 0,003%. Une séquence automatique

recalibre le point zéro et la pleine échelle toutes les 5 minutes.



D.4 Microprocesseur

Il contient toutes les fonctions logiques de l'appareil, réalise la linéarisation pour les convertisseurs non linéaires, compense les jonctions de référence, dirige l'afficheur digital et reconnaît les instructions.

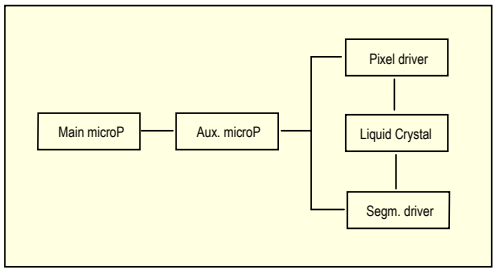
D.5 Programme spécifique

Le programme spécifique (256 kbits de mémoire) traite toutes les instructions logiques des circuits périphériques internes et réalise la linéarisation des équations. Il contient la fonction aide « HELP » et donne les instructions à l'écran graphique.

Les données d'étalonnage sont stockées dans la mémoire morte (EEPROM) du microprocesseur. Il est utilisé pour le stockage des paramètres d'installation (données de calibrage, données programme etc.).

D.6 Afficheur

L'afficheur à cristaux liquides permet l'écriture de graphiques et de caractères avec un fort contraste et un angle de lisibilité important. Un système de rétro-éclairage est disponible.



Différentes tailles de caractères sont utilisées afin de dissocier les valeurs mesurées et simulées des modes opératoires et des messages à l'opérateur.

La touche ← → permet d'inverser la zone d'affichage des valeurs d'entrée et de sortie.

L'intensité de rétro-éclairage peut être réglée de 2 façons en utilisant la fonction des touches « ENTER » et « ± » ou « , ».

Une grande intensité lumineuse réduit l'autonomie de la batterie.

Le contraste de l'affichage peut être réglé à l'aide des touches « ENTER » et Δ ou ∇.

D.7 Convertisseur Numérique Analogique (A/N)

La conversion A/N est constituée de la combinaison avec chevauchement partiel du convertisseur 10 bits et 12 bits pour obtenir une résolution de ± 21 bits.

Les deux convertisseurs sont conçus en utilisant les deux modes PWM du microprocesseur.

Le résultat de cette conversion en ±21 bits, commandée directement par le microprocesseur, est utilisée pour transformer la valeur des paramètres sélectionnés en un courant de sortie analogique

Un circuit analogique spécifique convertit le temps de modulation du PWM en tension contrôlée par une référence interne très stable et très précise.

Des relais sont utilisés pour sélectionner une des 6 sorties possibles en fonction de la plage sélectionnée:

-20 à +200 mV

-2 à +20V

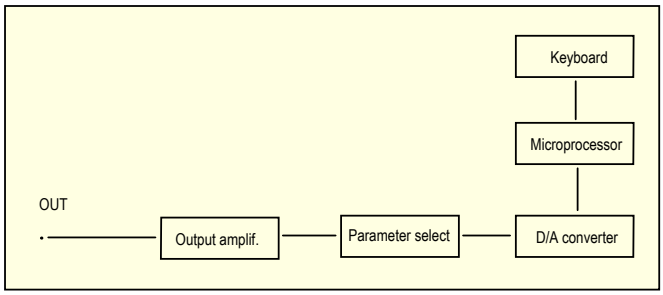
-0,2 à +2V

0 à 500 Ω

0 à 5 kΩ

-5 à 50 mA

Les signaux amplifiés sont envoyés à un circuit intégré qui génère la tension ou le courant requis par l'opérateur.



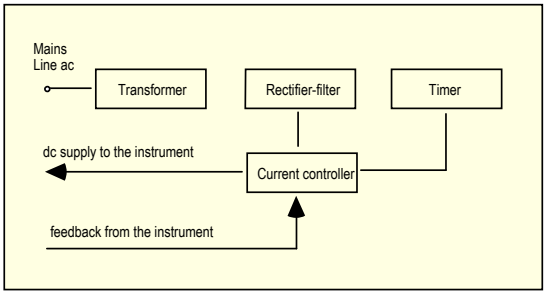
D.8 Chargeur de batterie et alimentation réseau

L'appareil est équipé d'un chargeur externe de tension permettant l'alimentation en 100, 120, 220, 240 Vac sous 50/60HZ.

Le circuit de charge utilise 3 différentes références pour :

la tension de contrôle 5,0 Vdc

le contrôle de charge batterie avec un maximum de 1,8 Adc (quand l'appareil est éteint)



D.9 Interface numérique

L'interface numérique sérielle est basée sur la fonction sérialisation du microprocesseur (SCI) (0 à 5 V).
Un adaptateur transforme les signaux TTL en signaux RS232.

D.10 Mesure de résistance et de sonde à résistance

Les « calys 1xxx » réalisent la mesure de température en mode 2 - 3 ou 4 fils.
Pour la mesure en 2 ou 4 fils, la méthode de mesure consiste à utiliser un circuit potentiométrique spécifique dans lequel on injecte un courant constant à partir des bornes I+ et I- et on mesure la chute de tension aux bornes du thermomètre qui est alors convertie en unité « engineering ». Pour la mesure en 3 fils, on injecte sur I- un courant équivalent à celui sur I+ pour compenser le déséquilibre.

D.11 Simulation de résistance et de thermosonde

Les « calys 1xxx » sont équipés d'un circuit électronique actif de simulation de résistance. Il est basé sur le fait qu'un calibrateur doit alimenter le courant d'excitation du capteur. Ce courant doit être entre 0,1 et 2 mA pour des résistances jusqu'à 100 Ω et entre 0,01 et 2 mA pour les Pt1000 et les calibres kΩ.
Une trop faible valeur génère une précision insuffisante et une valeur trop grande ne permettrait pas la simulation de grandes valeurs de résistances (la chute maximum de tension sur la simulation de résistance est de 2,5 V).
Le courant d'excitation doit être appliqué aux bornes adaptées.
Le courant mesuré est converti en tension par un amplificateur inverseur et utilise une référence par le convertisseur numérique analogique.

La sortie de l'amplificateur simule la variation de résistances en fonction de la consigne opérateur. Les bornes + et - de l'alimentation auxiliaire doivent être maintenues ouvertes.

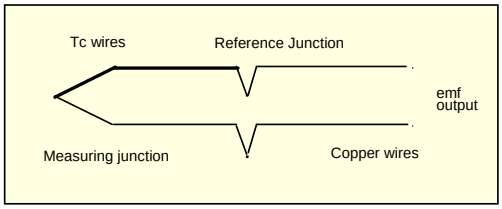
D.12 Circuit entrée/sortie pour thermocouples

Un thermocouple (capteur de température dans sa forme la plus commune) est constitué de deux fils de composition différente joints en une extrémité (jonction de mesure ou chaude).

Les deux fils sont reliés ensemble à deux points qui ont des températures différentes. Les deux extrémités libres du thermocouple doivent être gardées à la même température connue.

Les points de jonction sont, par définition, les jonctions de référence.

La jonction de référence est appelée jonction froide (Rj).



La température de la jonction de référence peut être maintenue stable ou la variation est compensée électriquement.

La jonction de référence des « calys 1xxx » » est située dans la borne négative (noire). A l'intérieur de cette borne est placée une sonde Pt100 (thermomètre à résistance) qui mesure avec précision la température de la jonction de référence.

Le microprocesseur utilise ce signal (Pt100) pour ajuster le signal d'entrée et compenser la température Rj.

Cette référence peut être interne, externe ou définie à distance.

E. VERIFICATION ET INSTALLATION

E.1 Déballage

Sortir l'appareil de l'emballage.

Suivre attentivement les instructions données. Vérifier que l'appareil n'ait pas subi de dommages durant le transport. Si une défaillance mécanique est notée, en faire part au transporteur et à « Besançon Instruments ». Le numéro de série est indiqué sur l'étiquette à l'arrière de l'appareil.

E.2 Boîtier

Le boîtier en ABS injecté est recouvert à l'intérieur d'un métal vaporisé pour protéger l'appareil des interférences électriques, ce qui permet d'utiliser l'appareil de trois façons différentes :

- portable avec sa valise de transport en cuir et sa bandoulière
- posé sur ses pieds
- monté en tableau

Une valise de protection en cuir avec couvercle et bandoulière peut être livrée sur demande.

E.2.1 Valise de protection

Deux valises en cuir sont disponibles sur demande.

L'une est prévue pour Les « calys 1xxx » seul, l'autre pour le rangement des accessoires.

E.2.2 Montage en tableau

Pour le montage en tableau, l'appareil est livré avec deux crochets à installer sur les bords du boîtier. La collerette biseautée de l'instrument est montée contre la platine de fixation. Les crochets maintiennent l'instrument par l'arrière du panneau. Dimensions du perçage : 242 x 88 mm (épaisseur max. 6 mm).

Des racks d'adaptation (112 x 433 mm) sont disponibles avec ouverture pour deux instruments.

E.2.3 Utilisation sur table

Le boîtier est équipé de deux pieds qui permettent de changer l'angle de vue.

F. ALIMENTATION

F.1 Alimentation - Batteries rechargeables

Les calibrateurs « calys 1xxx » sont alimentés par 4 batteries rechargeables. Après déballage, une charge complète des batteries est recommandée.

Connecter l'appareil au chargeur (l'appareil étant à l'arrêt) pour une période de 4 heures minimum. Utiliser l'éclairage de l'afficheur uniquement dans le cas où la lumière est faible pour limiter le déchargement des batteries.

Les batteries NiCd rechargeables ne s'abîment pas quand elles sont utilisées pour des opérations cycliques (chargement et déchargement continu).

Eviter de laisser l'appareil, avec les batteries totalement ou partiellement déchargées sur une longue période sans les recharger.

Dans le cas où la batterie faiblit (tension <4,5 V), le symbole "Low battery" apparaît à l'écran et un signal acoustique informe l'opérateur du temps disponible avant de devoir recharger l'appareil.

Lorsque le message "Low battery" apparaît, le symbole d'une petite batterie apparaît à l'écran;

F.1.1 Charge des batteries

Les batteries sont partiellement chargées à la livraison. Il faut donc les charger avant d'utiliser le calibrateur.

Hors utilisation, les batteries se déchargent lentement (2 à 6 mois).

La durée de recharge pour les batteries est de 4 heures environ pour 90%.

Lorque l'appareil est utilisé sur secteur, le niveau de charge ne s'effectue qu'à 50 % du maximum. Un symbole situé en haut et à gauche de l'écran indique que l'appareil est en charge. De même sur le chargeur, un témoin lumineux « rouge » indique que la charge est en cours et un témoin lumineux vert indique que l'alimentation secteur est connectée.

F.1.2 Comment optimiser l'utilisation des batteries

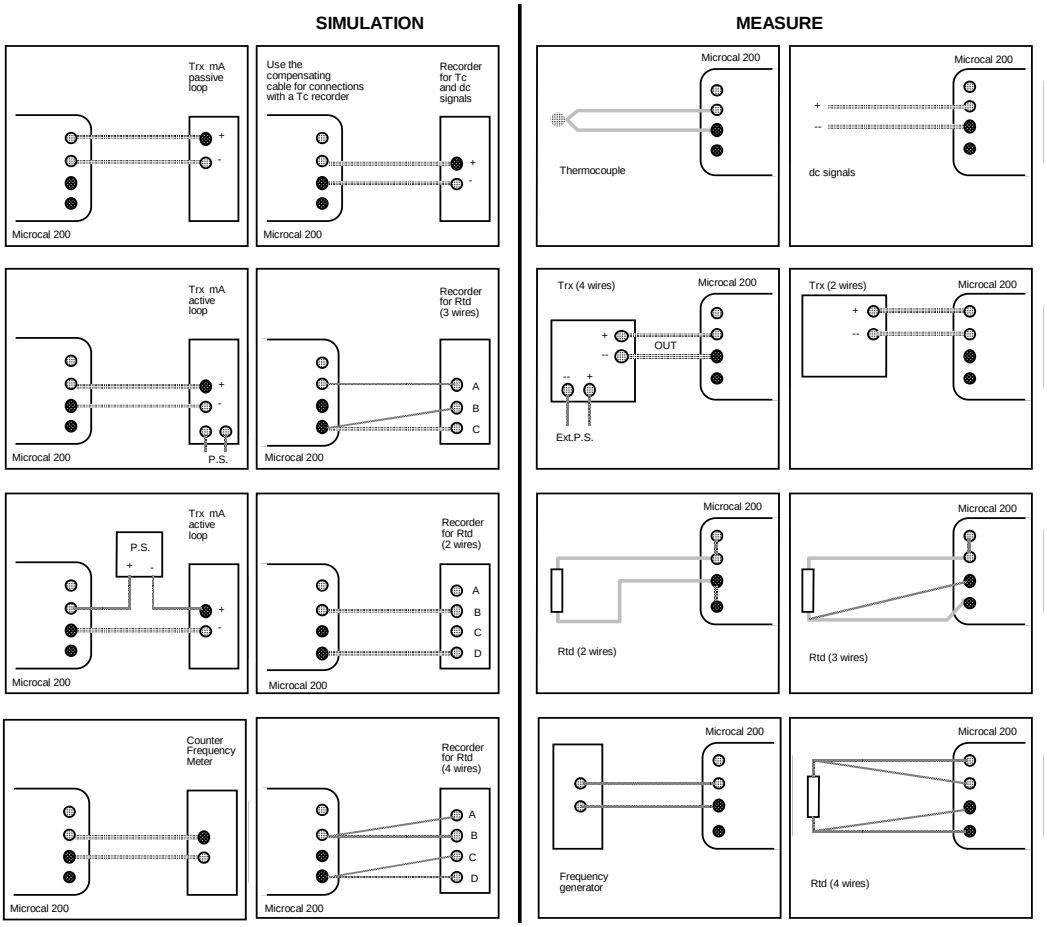
- Déconnecter l'alimentation réseau quand les batteries sont chargées.
- Utiliser les batteries jusqu'à leur décharge complète.
- Alimentation connectée : diminution de la durée de vie des batteries.
- Maintenir les contacts de batterie propres optimise le temps de fonctionnement.
- Sortir et remettre les batteries en place assure le contact électrique.
- Périodiquement, essuyer les contacts positifs et négatifs des batteries avec un chiffon sec.

L'extraction et la remise en place des batteries assurent un bon contact électrique. A faire quand la batterie n'a pas été utilisée pendant une longue période. Noter que l'autonomie diminue à basse température.

Une batterie N-Cd peut être rechargée 500 fois en suivant les consignes édictées,

Lors du remplacement des batteries, procéder au changement des 4 éléments simultanément,

Pour les longues périodes de stockage, il est recommandé de ne pas dépasser une température de 45°C, les températures élevées accélérant le procédé de décharge des batteries.



F.2 Raccordement des thermocouples

Lorsque les mesures doivent être réalisées avec des fils prolongateurs, on doit faire attention à la qualité des fils.

Il existe trois niveaux de qualité :

- première qualité ou spéciale
- qualité standard
- qualité fil d'extension

La limite d'erreur détermine le niveau de qualité du thermocouple.

La table ci-dessous donne les limites d'erreur des thermocouples de « première qualité et de qualité standard ». Les limites d'erreur des fils d'extension sont trop importantes pour entrer dans cette table (±4°C d'erreur possible).

Limite d'erreur des thermocouples

Les plages indiquées correspondent à la température limite pour l'erreur indiquée. Jonction froide à 0°C.

Tc	Class 1	Class 2	Class 3
type T	± 0.5°C (-40 to +125°C)	± 1°C (-40 to 133°C)	± 1°C (-67 to 40°C)
	± 0.004 . T (T >125°C)	± 0.0075 . T (T >133 °C)	± 0.015. T (T <-67°C)
T range	-40 to +350°C	-40 to +350°C	-200 to 40°C
type E	± 1.5°C (-40 to 375°C)	± 2.5°C (-40 to 333 °C)	± 2.5°C (-167 to +40°C)
	± 0.004.T (T >375°C)	± 0.0075.T (T >333°C)	± 0.015.T (T <-167°C)
T range	-40 to 800°C	-40 to 900°C	-200°C to 40°C
type J	± 1.5°C (-40 to 375°C)	± 2.5°C (-40 to 333 °C)	
	± 0.004.T (T >375°C)	± 0.0075.T (T >333°C)	
T range	-40 to 750°C	-40 to 750°C	
type K & N	± 1.5°C (-40 to 375°C)	± 2.5°C (-40 to 333 °C)	± 2.5°C (-167 to +40°C)
	± 0.004.T (T >375°C)	± 0.0075.T (T >333°C)	± 0.015.T (T <-167°C)
T range	-40 to 1000°C	-40 to 1200°C	-200°C to 40°C
type R & S	± 1°C (0 to 1100°C)	± 1.5°C (-40 to 600 °C)	
	± 1 + 0.003 (T-100) (T >1100°C)	± 0.0075.T (T >600°C)	
T range	0 to 1600°C	0 to 1600°C	
type B			± 4°C (600 to +800°C)
		± 0.0025.T (T >600°C)	± 0.005.T (T>800°C)
T range		600 to 1700°C	800 to 1700°C

Si nécessaire, utiliser les câbles de compensation de première qualité.

G. UTILISATION ET APPLICATIONS

Les « calys 1xxx » ont été calibrés en usine avant expédition.

Lors de la mise en marche, l'opérateur sélectionne et charge les paramètres utiles à son utilisation comme décrit ci-dessous.

Le calibrateur doit être utilisé dans une atmosphère où l'humidité est inférieure à 95 % et la température comprise entre -10°C et +55°C.

G.1 Mise en marche

Pour mettre en marche, appuyer sur « ON ». Les informations suivantes apparaissent en quelques secondes (identification de l'appareil, version et numéro de série). L'appareil commence un autodiagnostic.

Pour obtenir les meilleures performances, laisser l'appareil chauffer pendant 5 minutes.

Eviter d'utiliser le rétro-éclairage afin de préserver la batterie et de ne pas trop chauffer le calibrateur.

L'appareil est prêt pour mesurer (mode IN) avec le mode opératoire sélectionné.

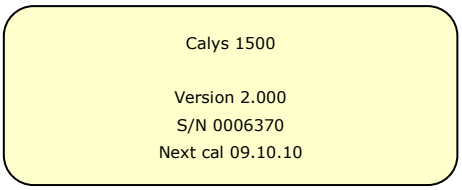
A + B : on presse sur A puis sur B en maintenant appuyé.

A + B : on presse sur A puis sur B.

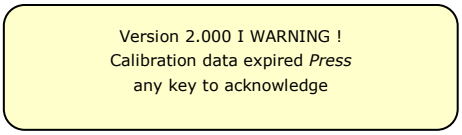
G.2 Date du prochain étalonnage

L'appareil possède une fonction d'avertissement lorsque le réétalonnage du calibrateur est recommandé.

La date du prochain recalibrage est validée par programmation dans la procédure de configuration.



Lorsque l'appareil est mis sous tension pendant la procédure de test, la date du prochain étalonnage apparaît. Si celle-ci est dépassée, un message d'alarme apparaît avec signal acoustique.



Appuyer sur n'importe quelle touche pour supprimer le message et aller dans le mode de fonctionnement normal.

G.3 Touche "HELP"

Toutes les actions à effectuer sur le clavier du de l'appareil sont simples et faciles. Chaque

action provoque l'affichage d'une Instruction compréhensive ou d'un message d'erreur.

Pour rendre encore plus facile l'utilisation par l'opérateur, le programme inclut un manuel

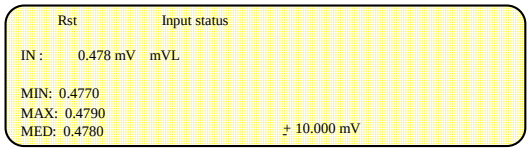
d'instructions.

G.4 Configuration générale

La configuration actuelle de l'appareil peut être facilement visualisée. Frapper la touche « STATUS » pour obtenir les pages écrans suivantes :

- **Etat général ("Input status") en mode mesure « INPUT »**

Mode de fonctionnement : valeur, unité, valeur mini, maxi et moyenne avec la variation en + ou en -, IN : mesure

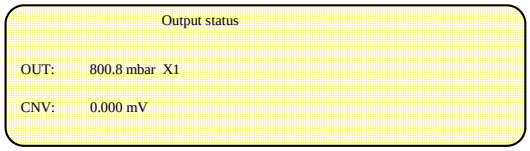


Les valeurs mini et maxi peuvent être réinitialisées par la touche Rst.

- **Etat interne ("Output Status") en mode simulation « Output »**

Visualisation : mode de fonctionnement, valeur et unité

CNV : conversion en signal électrique équivalent à l'unité technique



- **Etat interne (« Internai status ») - mode IN ou mode OUT**

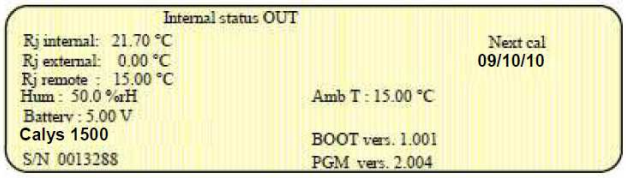
Les informations affichées sont :

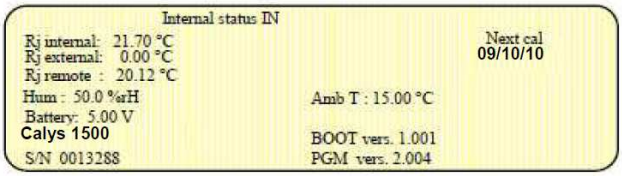
- Rj internai : température de la jonction froide interne
- Rj extemal : température de la jonction froide externe
- Rj Remote : température de la jonction froide à distance.

indique la température de la Pt100 qui peut être raccordée à l'arrière de l'appareil pour la mesure de la température à l'endroit de la jonction froide.

Si la Pt 100 n'est pas raccordée, l'Information hors plage "Underrange" apparaît.

- Battery : tension batterie avec indicateur de charge
- S/N : numéro de série de l'appareil
- Version du programme Boot
- Version du programme interne
- Date du prochain étalonnage si programmé



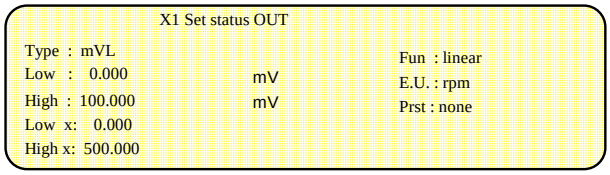


- **Etats de 5 rubriques de caractérisation x1 - x2 x3 x4 x5 (set status) en mode simulation « OUT » ou en mode mesure « IN »**

Configuration des 5 pages avec affichage des valeurs programmées.

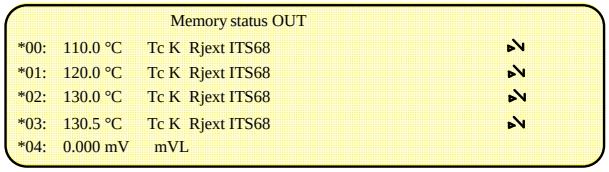
- Type : type de signal ou de capteur
- Low : valeur du signal électrique pour le zéro
- High : valeur du signal électrique pour la pleine échelle
- Low x : valeur affichée pour le zéro électrique
- High x : valeur affichée pour la pleine échelle électrique
- Fun : mode de linéarisation / linear : linéaire / square : racine carrée
- E.U. : symbole de l'unité

En appuyant sur Δ ou ∇, on choisit la ligne concernée ;



- **Valeurs mémorisées (Memory status)**

4 pages pour 20 mémoires sont disponibles pour chaque rubrique (5 possibles) accessibles en appuyant sur STATUS en mode IN et en mode OUT.


Memory status OUT
*00: 110.0 °C Tc K Rjext ITS68
*01: 120.0 °C Tc K Rjext ITS68
*02: 130.0 °C Tc K Rjext ITS68
*03: 130.5 °C Tc K Rjext ITS68
*04: 0.000 mV mVL

En appuyant sur Δ ou ∇, on rappelle la page précédente ou suivante (0-4, 5-9, 10-14, 15-19), En appuyant sur IN -OUT, on peut rappeler les pages en mode IN ou vice versa.

- **Etat des alarmes**
  - tension batterie
  - dépassement sur mode IN
  - dépassement sur mode OUT
  - date de calibration
  - température de jonction en mode IN
  - température de jonction en mode OUT

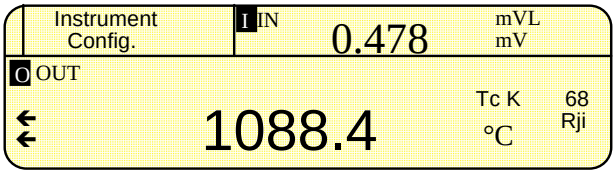
G.5 Réglage de la configuration générale

Cette procédure permet la configuration de l'appareil avec les paramètres ci-après :

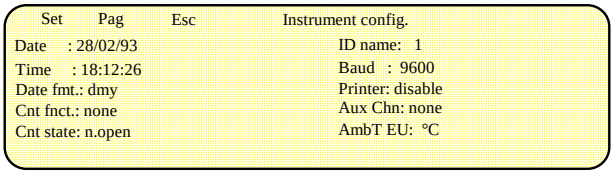
- **Date :** réglage de l'horloge interne - réglage date, mois et année
- **Time :** réglage de l'horloge interne - réglage heure, minutes, secondes
- **Date fmt :** configuration du format d'affichage de la date soit JMA ou MJA
- **Cnct Fnct :** sélection du mode « contacts » sans clavier, mémorisé - remote : à distance
- **Cnct state :** sélection du type de contact "n.open" (normalement ouvert) ou "n.closed" (normalement fermé).

- **ID Name** : normes d'identification pour la liaison série : 1 à 99
- **Baud :** vitesse de transmission de la liaison série : OFF - sans, 300, 600, 1200, 2400, 4800, 9600 et 19200
- **Avg wgt** : réglage du nombre de mesures pour la filtration (1à 255) (moyenne)
- **Printer :** sélection ou non d'une imprimante (enable : sélectionnée - disable : non sélectionnée)
- **STO / RCL :** sélectionne la mémorisation et le rappel des opérations simultanément sur le mode IN et OUT
- **AUTO/np :** sélectionne l'arrêt automatique du rétro-éclairage après 5 minutes

– Appuyer sur touche **« MENU »** jusqu'à obtention de l'affichage du message « Instrument Config. »



– Appuyer sur une des trois touches **« Instrument Config. »**



Appuyer sur les touches Δ ou ∇ pour sélectionner la valeur du paramètre.

Appuyer sur la touche « Set » pour entrer la valeur du pas

Appuyer sur les touches Δ ou ∇ pour régler ou modifier les valeurs du paramètre sélectionné.

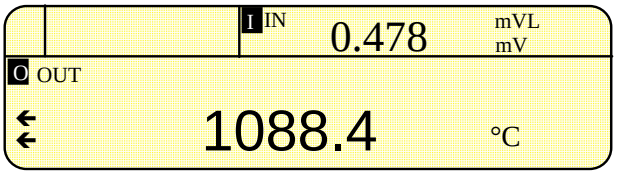
Appuyer sur la touche "Enter" chaque fois qu'il faut valider ou mémoriser une valeur.

Appuyer sur "Esc" pour revenir à la page précédente du menu dans la nouvelle configuration saisie.

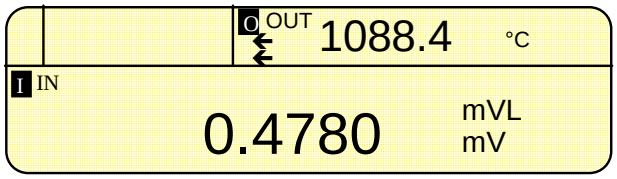
G.6 Sélection mode mesure / simulation (IN/OUT

– Mettre l'appareil sous tension.

– Après un diagnostic, le calibrateur se met en mode mesure (IN) avec les paramètres précédemment sélectionnés



Il suffit de presser sur la touche ← → pour intervertir la visualisation.



La valeur générée peut être ajustée via les touches Δ e ∇ ou par saisie de la valeur numérique pour utilisation de la touche « NUM » et les touches numériques nécessaires de « 0 » à « 9 ».

G.7 Position du point décimal

Les touches ← et → permettent le réglage du point décimal pour les plages Te et Rtd et Hz. Il en est de même pour les mV et Ω.

G.8 Mode filtration (average)

L'appareil est équipé d'un algorithme spécial permettant le lissage des mesures instables. Le poids pour le calcul de la moyenne peut être programmé de 1 à 256 via la solution de la configuration générale.

La bonne valeur à sélectionner doit être faite par tests successifs tout en sachant qu'un poids élevé provoquera un filtrage important.

G.9 Fonction de maintien, de câblage de la Pt100 pour compensation de soudure froide externe

L'appareil est équipé d'une fonction de maintien pour figer la valeur affichée sur un événement.

Le type et le mode d'événement peuvent être programmés en mode local par le clavier ou en mode

distance par contact externe.

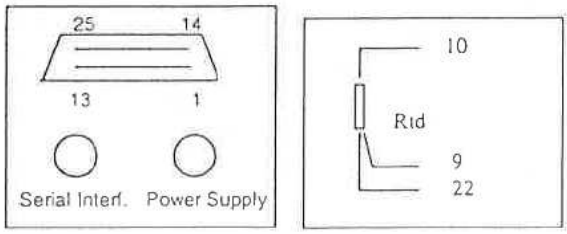
Lorsque le mode distance (remote) est sélectionné, le type de contact doit être programmé :

– normalement ouvert (n.open)

– normalement fermé (n.closed)

Le contact du mode déclenchement à distance doit être câblé entre les bornes 1 et 2 du connecteur situé à l'arrière de l'appareil.

L'appareil peut fonctionner avec une mesure de soudure froide à distance.



G.10 Sélection du paramètre ou du capteur

Pour sélectionner un paramètre électrique ou un capteur en simulation ou mesure, suivre les procédures suivantes :

- Cette mesure nécessite une sonde Pt100 qui doit être câblée entre les bornes 4/5/7 raccordées ensemble et la borne 6 de ce connecteur.
- Mettre l'instrument en marche « ON »
- Sélectionner le mode « IN » (Mesure) ou « OUT » (Simulation) - touche « IN-OUT ».
- Presser la touche « SELECT » pour obtenir le menu suivant indiquant les différentes gammes électriques et les capteurs thermoélectriques.
- Une 2ème page MENU peut être visualisée en appuyant sur la touche Pg ∇.
- Presser les touches Δ ∇ ou ← → pour sélectionner le signal et le capteur.
- Presser « ENTER » pour mémoriser la sélection. L'appareil retourne au mode opératoire en cours avec la sélection mémorisée.

Si on presse sur « Esc » au lieu de « ENTER » l'appareil retourne au mode opératoire avec les anciens paramètres.

Vérifier la bonne solution du capteur en utilisant la table suivante :

IEC	α = 0,00385
OIML	α = 0,003910
USLAB	α = 0,003926
US	α = 0,003902
SAMA	α = 0,003923
JIS	α = 0,003916
Pt200, Pt500, Pt1000	α = 0,00385
Pt1000 OIML	α = 0,003910

G.11 Facteur d'échelle mode set up

Le facteur d'échelle est une méthode qui permet de lire ou de simuler un signal électrique directement dans une unité procédée.

Par exemple, la procédure d'installation du facteur d'échelle pour l'étalonnage d'un enregistreur potentiométrique avec une échelle de 0,0 mbar à 400,0 mbar correspond à un signal électrique linéaire de 4 à 20 mA.

- Mettre l'appareil en marche « ON »
- Sélectionner le mode « IN » ou « OUT »
- Presser « SELECT » pour obtenir le menu
- Presser sur les touches Δ∇ou ←→ pour sélectionner le programme X1, X2.....Xn
- Presser sur « Set » pour entrer la configuration du programme X1, X2, ...Xn
- Appuyer sur Δ ou ∇ pour ajuster les paramètres de facteur d'échelle
- Presser « Esc » pour retourner à la page précédente ou pour un nouveau Set up
  - Low entrer la valeur basse du signal électrique
  - High entrer la valeur de pleine échelle du signal électrique
  - Low x entrer la valeur basse de l'échelle du signal désiré
  - High x entrer la valeur de pleine échelle du signal désiré
  - Fun. sélectionner le mode linéaire ou racine carrée
  - E.U. sélectionner l'échelle du signal désiré

Après chaque réglage, appuyer sur « ENTER » pour mémoriser la nouvelle donnée.

Appuyer sur la touche ∇ pour sélectionner le type.

Appuyer sur SET pour faire apparaître la sélection des « type »

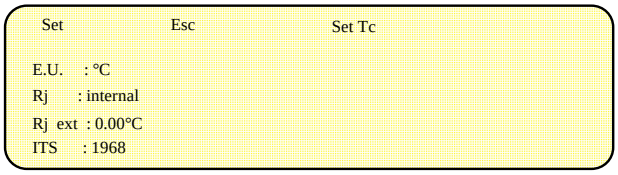
Appuyer sur les touches Δ ou ∇ pour sélectionner le type parmi : mVL, mVH, V, mA, Hz, Ω, kΩ, 0-100 mV, 0-10 V, 1-5 V, 0-20 mA, 4-20 mA, 0-500 Ω, 0-5 kΩ. Appuyer sur ENTER pour valider

G.12 Modes °C, °F, Rj et configuration EIT (ITS : International Température Scale)

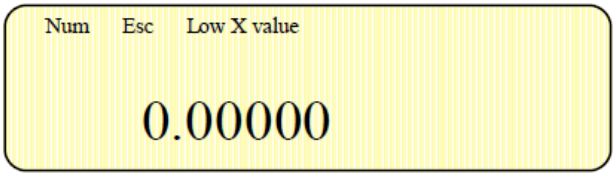
- Presser sur « SELECT » pour entrer la procédure et obtenir la page de menu des différents capteurs (relation de thermocouples)
- Presser « SET » pour obtenir par exemple les informations suivantes :
  - E.U. = °C ou °F ou K
  - Rj : référence de soudure froide
  - Interne : compensation automatique aux bornes d'entrée avec un film P1100 calibré
  - Externe : ajustable de -50°C à +100°C
  - A distance : nécessite l'utilisation d'une Pt100 externe

- Rj est. (jonction interne) : réglage de -50°C à +100°C
- ITS (Echelle Internationale de température) : 1968 ou 1990

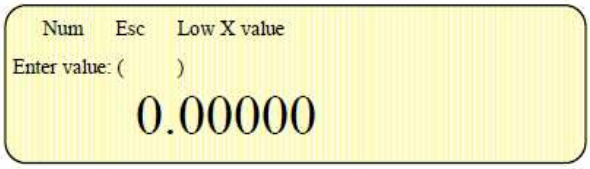
– Presser sur Δ ou ∇ pour sélectionner le paramètre à ajuster
– Presser <Set> pour permettre la sélection du paramètre ajusté
– Presser Δ ou ∇ pour sélectionner la configuration de l'application
– Presser <ENTER> pour mémoriser la nouvelle sélection
– Presser <Esc> deux fois pour retourner au mode opératoire.



L'écran peut alors se présenter comme ci-dessous :



Pour inscrire la valeur, on peut utiliser le clavier digit par digit ou le mode numérique en sélectionnant la touche « NUM » pour obtenir l'indication suivante :



Dans ce cas, on rentre la valeur numérique avec le point décimal puis on valide à l'aide de la touche ENTER.

En appuyant sur la touche ESC on retourne à la page précédente ou on annule le réglage en cours. L'unité Engineering (EU) peut être définie par scrutation continue en utilisant les 4 dernières touches sur le tableau ci-joint.

Il suffit d'appuyer à chaque fois sur la touche ENTER pour valider par exemple : mbar.

G.13 Sélection rapide du mode Rj

Pendant une opération avec des thermocouples en mesure ou simulation, l'opérateur peut directement changer le mode Rj (soudure froide).

– Presser <MENU> et le mode Rj désiré
  Rj int. (Mesure de compensation de soudure froide interne)
  Rj ext. (Mesure de compensation de soudure froide externe)
  Rj rem. (Mesure de compensation de soudure froide à distance via PT100 externe).

Le nouveau mode de mesure de compensation de soudure froide sera opérationnel jusqu'au nouveau changement.

Néanmoins cette sélection n'est pas mémorisée. Si l'appareil est arrêté, il reviendra à un mode Rj sélectionné précédemment durant la sélection de configuration.

G.14 Mémoires Entrées/Sorties

La disponibilité d'une mémoire de 20 pas représente une capacité importante aussi bien en simulation qu'en mesure.

En mode mesure, il peut être utile de stocker 20 valeurs de mesure pour des conditions de test spécial.

En mode simulation la disponibilité de 20 valeurs de mesure peut être utile par exemple pour l'étalonnage de l'échelle d'un enregistreur.

Pour charger en mémoire chaque partie de mémoire, sélectionner d'abord le mode opératoire approprié et ajuster la valeur désirée.

– Presser <STO>, <0>...<9> pour mémoriser les valeurs dans la mémoire choisie 0 à 9
– Presser <STO>, <ENTER>, <0>...<9> pour mémoriser les valeurs dans la mémoire choisie 10 à 19.
– Presser <RCL>, <0>...<9> pour rappeler la mémoire 0 à 9
– Presser <RCL>, <ENTER>, <0>...<9> pour rappeler la mémoire 10 à 19.

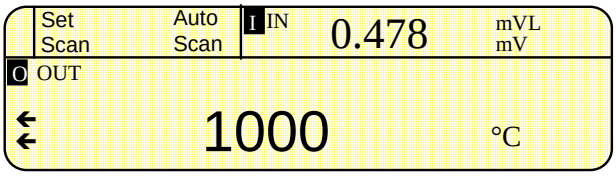
Les valeurs mémorisées peuvent être revues en pressant <STATUS> pour obtenir les 4 pages des valeurs mémorisées.

G.15 Programme de scrutation automatique

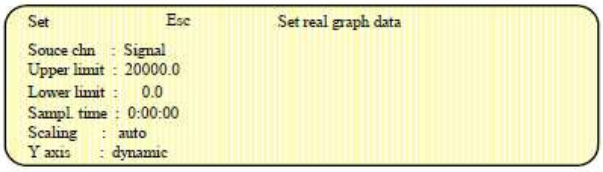
Il est basé sur 20 valeurs mémorisées qui peuvent être adressées par séquence sur les bornes de sortie.

Avec l'instrument dans un mode d'opération normal, presser <MENU> pour obtenir les indications.

– Presser <SET> pour définir le programme de balayage et obtenir les indications (Set / Auto Scan)
– Appuyer sur Δ et ∇ pour sélectionner les paramètres à changer



- Presser <SET> pour permettre la sélection du paramètre ajusté
- Presser Δ ou ∇ pour ajuster la valeur ou le mode désiré
- Presser <ENTER> pour mémoriser la nouvelle donnée
- Presser <Esc> pour retourner au mode opératoire normal
- Presser <Autoscan> pour lancer le programme

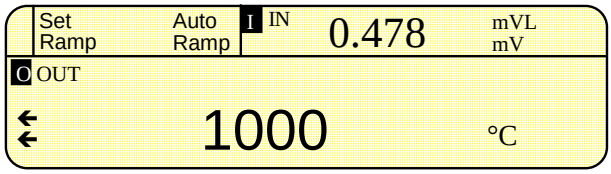


- Presser n'importe quelle touche pour stopper le programme

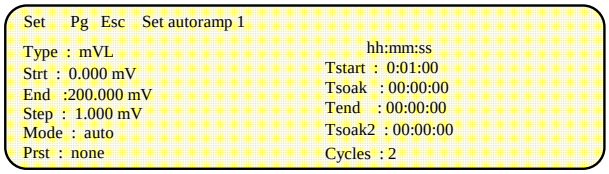
G.16 Programme de rampe

L'appareil peut être programmé pour générer des cycles de simulation continus ou par pas.
En programmant une incrémentation par pas à la valeur minimale (0,1 ou 1 degré résolution) la rampe par pas peut être assimilée à une rampe continue.
Sélectionner d'abord l'unité °C ou "F ou K, le type de thermocouples et ensuite suivre la procédure suivante :

- Presser <MENU> pour obtenir les indications suivantes (Set Auto Ramp)

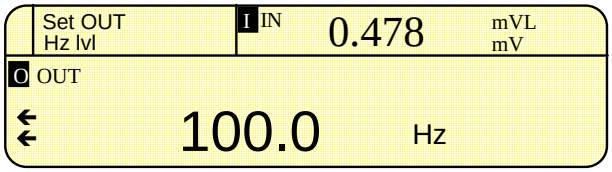


- Presser SET RAMP
- Presser <Pg ∇ pour sélectionner Autoramp 1 ou Autoramp 2
- Presser Δ ou ∇ pour sélectionner le paramètre à modifier ou ajuster
- Presser <SET> pour permettre la sélection du paramètre ajusté
- Presser Δ ou ∇ pour modifier ou ajuster le paramètre
- Presser <ENTER> pour mémoriser chaque paramètre modifié.

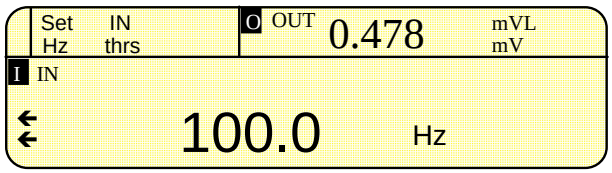


Mode Simulation en fréquence :

- sélectionner le mode simulation (OUT) en fréquence Appuyer sur la touche MENU pour obtenir l'indication suivante :



Puis appuyer sur la touche SET OUT H2 Lvl pour régler la tension de sortie de 0 à 20 V.
Ajuster la valeur à l'aide des touches Δ et ∇ ou à partir du clavier numérique à l'aide de la touche NUM.
Appuyer sur ENTER pour valider.
Ajuster la fréquence à l'aide des touches ∇ et Δ ou à partir du clavier numérique à l'aide de la touche NUM.
Le point décimal se règle à l'aide des touches ← → de 0,1 , 0,01 à 0.001 Hz.
Mode « mesure de fréquence »
Sélectionner le mode Mesure 'IN' en fréquence
Appuyer sur la touche MENU pour obtenir l'indication suivante :



Appuyer sur SET IN Hz T Hrs pour régler la tension puis procéder comme ci-dessus.

Mode « Convertisseur »

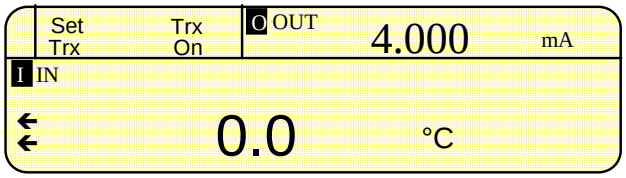
L'appareil peut être utilisé pour remplacer un convertisseur ou un transmetteur.
Le signal d'entrée peut être converti en tout autre signal électrique en assurant une isolation galvanique.

G.17 Réglage du mode Tare (Offset)

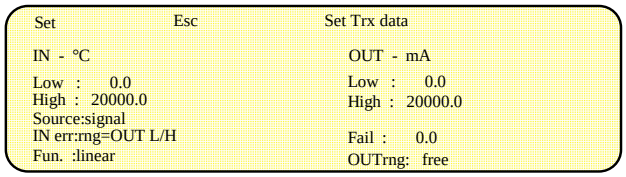
Ce mode permet de déterminer un décalage en mesure ou simulation pour annuler l'influence d'une portion de signal non désirée.

- Sélectionner le mode opératoire
- Presser <MENU> pour obtenir les indications suivantes (Ofs On)
- Presser <Ofs On> pour activer le mode de dépassement ou <Ofs Off> pour le désactiver
- Presser <ENTER> pour mémoriser la valeur d'offset indiquée
- Presser <MENU> pour retourner au mode opératoire
- Pour le mode simulation, enregistrer l'indication de l'appareil à calibrer
- Ajuster la sortie du calibrateur pour atteindre l'indication de l'instrument sous test
- Presser <ENTER> pour annuler les portions de signal non désirées.

- Appuyer sur la touche MENU pour faire apparaître l'indication suivante:

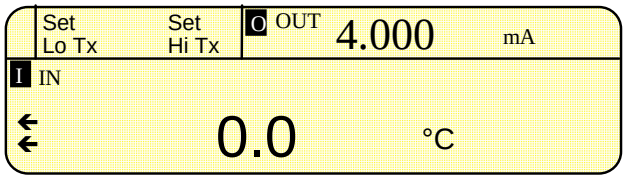


- Puis appuyer sur la touche SET TRX pour définir les paramètres souhaités :



- Appuyer sur les touches Δ et ∇ pour sélectionner le paramètre à renseigner.
- Appuyer sur SET pour régler la valeur.
- Appuyer sur ENTER pour valider.
- Appuyer sur Trx ON pour valider ce mode
- Veiller après utilisation de l'application à supprimer le programme en appuyant sur Trx OFF.

En fonctionnement, l'afficheur se présente comme ci-dessous :



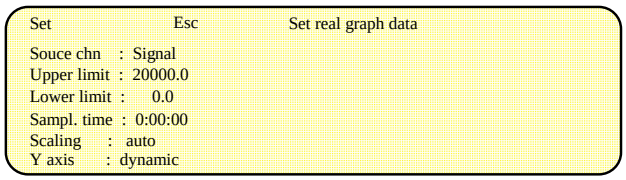
Appuyer sur SET Lo Tx ou SET Hi Tx pour mémoriser les valeurs mini et maxi

Utilisation en mode graphique

Cette fonction est possible lorsque l'appareil est équipé de l'option enregistrement et de l'horloge de temps.

Appuyer sur la touche MENU pour faire apparaître l'indication SET GRAPH - REAL GRAPH sur l'écran.

Appuyer sur la touche SET GRAPH pour définir les paramètres souhaités.

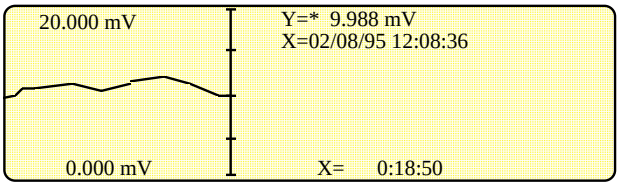


Appuyer sur les touches ∇ et Δ pour sélectionner le paramètre à renseigner.

Appuyer sur SET pour définir les valeurs (Res. time est le temps séparant deux mesures et l'axe des Y peut être fixe ou mobile).

Appuyer sur ENTER pour valider.

Appuyer sur REAL GRAPH pour visualiser le graphe.



au bas correspond au temps total depuis le début de l'enregistrement.

Autres fonctions :

← →	Retour à la page précédente
STATUS :	Supprime les chiffres pour ne visualiser que le graphe (en appuyant une deuxième fois, on retourne à la page)
RCL :	
STO :	Bloque le graphe

ENTER + ← → Déplace l'axe Y (FAST rapide) et indique la valeur instantanée.

Pour visualiser ces données, il suffit d'appuyer sur HELP pendant le graphe.

Sélection en mode sonde à résistance 3 fils ou 4 fils

Appuyer sur la touche MENU pour faire apparaître 3 WIR ou 4 WIR.

Appuyer sur la touche en relation avec le choix défini.

H. OPTIONS ET ACCESSOIRES

H.1 Imprimante externe (option)

L'appareil peut être livré sur demande avec une imprimante externe.

L'imprimante pour papier de 58 mm permet l'établissement d'un rapport de test des valeurs mesurées, générées ou stockées.

L'imprimante est directement alimentée par l'appareil via le connecteur 9 broches situé à l'arrière de l'appareil et possède son propre microprocesseur pour le décodage des caractères.

L'imprimante est livrée avec un câble à raccorder directement sur l'appareil. Le raccordement est le suivant :

broche 1 : Vdc
broche 2 : —
broche 3 : —
broche 4 : —
broche 5 : masse
broche 6 : Vdc
broche 7 : Tx
broche 8 : busy (occupé)
broche 9 : masse

H.1.1 Recommandations générales

L'imprimante à impact requiert une grande puissance risquant ainsi de décharger rapidement les batteries.

Pour un fonctionnement de l'imprimante en mode autonome, c'est-à-dire sur batterie, celles-ci doivent au préalable être chargées au maximum.

Une faible tension de la batterie provoque une mise hors service de l'imprimante. En mode mesure ou simulation de précision, attendre 30 secondes avant utilisation de l'imprimante. Le rétro-éclairage des « calys 1xxx» est automatiquement éteint lors de la mise en fonctionnement de l'imprimante.

Toute touche appuyée arrête l'impression après PRINT. Appuyer sur Adv On pour avancer et Adv Off pour arrêter. Lorsque le message Busy subsiste plus de 5 secondes, le message d'erreur ERROR apparaît sur l'écran et il faut vérifier la connexion.

H.1.2 Fonctionnement de l'imprimante

Presser plusieurs fois sur « MENU » pour faire apparaître Instrument config. Presser sur Instrument Config.

Presser sur Δ ou ∇ pour sélectionner le paramètre imprimante (printer). Presser « Esc » pour entrer dans le mode de sélection.

Presser Δ ou ∇ pour choisir le mode désiré (disable : non sélectionné - enable : sélectionné)

Presser sur ENTER pour valider

Presser « Esc » pour retourner dans le mode opératoire.

Appuyer sur « Prt » pour imprimer.

H.2 Fonction Data Logging

Les «calys 1xxx» sont équipé d'une mémoire interne permettant une fonction acquisition à intervalles programmables.

Si les données sont gardées en mémoire, même si le calibrateur est déchargé, l'option table A-1 doit être installée.

Cette fonction peut être utilisée uniquement lorsque l'appareil est équipé d'une mémoire non volatile (sauvegardé).

L'option Table A-1 comprend également l'horloge temps réel et le logiciel de déchargement des données sur PC.

La mémoire a une capacité de 1500 données.

La procédure d'utilisation est la suivante :

- Mise en service ON
- Sélection de la grandeur
- Appuyer sur MENU pour afficher sur l'écran SET LOG et RUN LOG
- Appuyer sur SET LOG pour définir les paramètres

- Appuyer sur A et V pour sélectionner le paramètre à modifier (par exemple « Sampling time » = temps séparant deux mesures)
- Appuyer sur SET pour définir la valeur de 00 (h) 00 (m) 01 (s) à 12 (h) 00 (m) 00 (s).
- En appuyant sur ENTER, on valide, en appuyant sur ESC on quitte
- On peut ainsi définir les autres paramètres pour une éventuelle représentation graphique.
- En appuyant 2 fois sur ESC on revient à la page initiale.
- Il suffit alors d'appuyer sur RUN LOG pour commencer le programme d'acquisition.
- Sur l'afficheur, la fonction LOG avec l'indication END LOG sont indiquées.
- A chaque mémorisation, l'indication **** remplace LOG pendant quelques secondes.
- Le programme s'arrête automatiquement après la mémorisation des 1500 données ou sur instruction de l'opérateur en appuyant sur END LOG.
- Sur l'afficheur, on peut alors lire SET LOG DIS LOG RUN LOG.
- Il suffit d'appuyer sur DIS LOG pour visualiser les valeurs mémorisées.

On peut changer de page en appuyant sur Pg Δ et Pg ∇.

D'autres fonctions sont disponibles :

GO Δ : début de l'acquisition (après avoir appuyé sur MENU)

GO ∇ : find e l'acquisition (après avoir appuyé sur MENU)

Esc : retour à la page précédente

Go : sélectionner une valeur

ENTER : retour à la page précédente

Pour obtenir un graphe, il faut appuyer sur MENU et obtenir l'indication « FULL GRAPH » pour « PART GRAPH ».

En appuyant sur Full graph ou Part Graph, on obtient le graphe correspondant.

En appyant sur $\leftarrow$ $\rightarrow$, on retourne sur la page des valeurs, et sur Esc, à la page normale.

Si on désire initier une nouvelle acquisition en appuyant sur Run Log, un message apparaît pour avertir l'utilisateur de l'effacement des valeurs mémorisées : en appuyant sur Yes, on efface les valeurs existantes et on commence un nouvel enregistrement.

Impression des valeurs enregistrées :

A partir de la dernière page de l'enregistrement où figurent les valeurs enregistrées et les indications Pg Pg Esc Logging date et End Log, appuyer sur la touche MENU pour faire apparaître l'indication Prt. Appuyer sur la touche Prt pour imprimer les valeurs sous la forme suivante :

24.06.93		16:08:21
TcT Rj	int	ITS68
1	328.6 °C	
0:00:00		
2	326,3°C	
0:01:00		
3	322.8°C	
0:02:00		

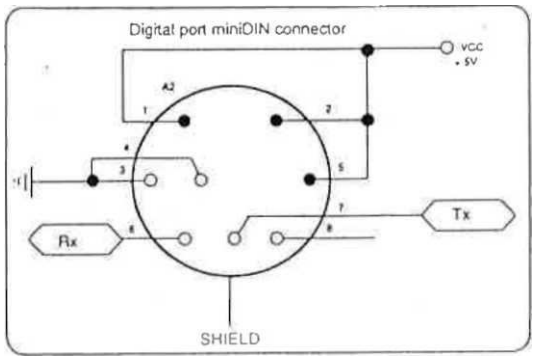
Il suffit d'appuyer sur une touche pour arrêter l'impression, le message «.... cancelled » apparaît alors sur le document pour prévenir de l'interruption.

I. INTERFACE DIGITALE

Les « calys 1xxx» sont équipés d'une interface TTL avec la possibilité de raccorder un connecteur TTL / RS 232. Cette interface permet la communication du calibrateur avec un ordinateur.

Configuration de la liaison entre le MICROCAL 200 et un PC :

- Définition de la vitesse transmission voir status (Pas de parité, 8 bits d donnés, 1 bit stop).



I.1 Protocole de communication du Microcal 200 à un PC

J. MAINTENANCE

Les « calys 1xxxx » ont été testés et calibrés en usine. L'étalonnage doit être vérifié et réajusté si l'appareil dépasse l'erreur donnée dans les spécifications ou lorsqu'un composant critique actif ou passif est remplacé.

J.1 Recommandations

Les éléments primaires (thermocouples, thermomètres à résistance) sont normalement reliés à des potentiels électriques égaux ou proches de la masse. Dans certaines applications, ils peuvent présenter une tension commune à la terre.

Tester la tension entre les bornes d'entrée et la masse pour vérifier qu'elle soit applicable aux appareils à connecter au calibrateur.

J.2 Stockage

Si l'appareil ne doit pas être utilisé pendant une période assez longue, il est recommandé de sortir les batteries.

Température de stockage : -30°C à +60°C / humidité inférieure à 90 %.

Si le calibrateur n'a pas servi pendant un mois, tester la tension des batteries, et charger les batteries NiCd pendant au moins 12 heures.

J.3 Message d'erreurs

OVERRANGE UNDERRANGE	IN	indique un dépassement du maxi
	IN	indique un signal négatif inférieur à la valeur admissible
Rj err (high)	IN-OUT	indique une valeur de Rj interne ou à distance supérieure aux valeurs limites (°55°C ou +100°C pour la sonde à distance)
Rj err (low)	IN - OUT	indique une valeur de Rj inférieure à la valeur limite (-10°C)
Cale. err.	IN - OUT	erreur possible pendant le programme de facteur d'échelle
OVERVOLTAGE	OUT – mA	indique une résistance de charge supérieure à la valeur limite
OVERCURRENT	Other OUT s	indique une résistance de charge inférieure à la valeur limite indique des conditions de dépassement
OVERFLW UNDERFLW FREQ ERR	IN	indique des conditions de dépassement indique une fréquence mesurée en dehors des limites acceptables
xxxxxxx (MEASURE WAIT) ZERO ERR	IN IN	incohérence des valeurs max, min ou med. le circuit mesure est défaillant le zéro interne est défectueux

J.4 Remplacement des fusibles

Les protections par fusibles sont définies ainsi :

Mode mesure (IN) : mV – V	protection interne jusqu'à 50 V
Mode mesure (IN) : mA	protection par 2 fusibles lents sur la carte principale
Mode mesure (IN) : Rtd	protection interne et par 2 fusibles.
Mode simulation (OUT) : mA	protection interne par limitation de courant à 2 mA plus une protection par fusible.
Mode simulation (out) : mA	protection interne par impédance et par fusibles.
Mode simulation (OUT) : Rtd	protection interne par un système de courant limité pour 5 V avec un fusible sur la carte output auxiliaire (100 mA).

La protection est effectuée sur les bornes A et B ou A et C.

- la carte d'alimentation (IN) pour les mA est protégée en cas d'inversion de tension de 100 Vcc.
- Le circuit est également protégé par une limitation du courant à 60 mA et un fusible.
- la carte d'alimentation (OUT) pour les mA est protégée en cas d'inversion de tension de 100 Vcc. Le circuit est également protégé par une limitation du courant à 60 mA et un fusible .

Réexpédition

Dans le cas d'une réexpédition, utiliser de préférence l'emballage d'origine et indiquer, le plus clairement possible, par une note jointe à l'appareil, les motifs du renvoi.

AOIP SAS
Rue Dupont Gravé
F-14600 Honfleur

From France :
01.69.02.89.30
From your country :
+33(1) 69.02.89.50

Fax : +33(1) 69 02 89 60
Email : sav@aoip.com

Avertissement
L'emballage fourni avec le calibrateur peut supporter une pression maximale de 20 bar à 21°C (290 psi à 70°F). Faire subir au colis une pression plus élevée risque d'endommager l'appareil.

J.5 Protocole de communication Calys 1xxx ←→PC

calys 1000/1200/1500

2 channels high accuracy multifunction calibrators

Instructions Manual

Instructions Manual NTA 47xxx-xxxA1

LIMIT OF GUARANTEE AND LIMIT OF RESPONSIBILITY

AOIP S.A.S guarantees the absence of faulty materials and the manufacture of this product under normal conditions of use and maintenance. The guarantee period is one year and takes effect on the date of delivery. Parts, repairs to the product and service are guaranteed for a period of 90 days. This guarantee only applies to the original purchaser or the end user if he is a client of a AOIP S.A.S approved distributor and does not cover fuses, interchangeable batteries/cells nor any product which, in the opinion of AOIP S.A.S, has been badly handled, modified, neglected or damaged by accident or subjected to abnormal conditions of use or handling. AOIP S.A.S guarantees that the software will function largely in accordance with its functional specifications for a period of 90 days and that it has been correctly recorded on non-defective media. AOIP S.A.S does not guarantee that the software contains no errors or that it will operate without interruption.

AOIP S.A.S approved distributors shall apply this guarantee to products sold to new clients it has not served, but are not authorised to offer a longer or different guarantee in the name of AOIP S.A.S. Guarantee support is offered if the product was purchased by an intermediary from an AOIP S.A.S approved point of sale or if the purchaser has paid the applicable international price. AOIP S.A.S reserves the right to invoice the purchaser for the costs of importing, repair or replacement parts if the product purchased in one country was sent to another country for repair.

The obligations under the guarantee of AOIP S.A.S are limited at the discretion of AOIP S.A.S, to reimbursement of the purchase price, or the free repair/replacement of a defective product returned within the period of the guarantee to an AOIP S.A.S approved service centre.

To claim for service under the guarantee, contact the nearest AOIP S.A.S agent or send the product, accompanied by a description of the problem, carriage and insurance paid (free on board destination), to the nearest AOIP S.A.S approved service centre. AOIP S.A.S declines any responsibility in the event of damage occurring during transportation. After repair under guarantee, the product will be returned to the purchaser, carriage paid (free on board destination). If AOIP S.A.S considers that the problem was caused by abusive treatment, modification, an accident or abnormal conditions of operation or handling, AOIP S.A.S will submit a quotation for the cost of repair and will only commence the repair after receiving authorisation. After repair, the product will be returned to the purchaser, carriage paid, and the costs of repair and transportation will be invoiced to him.

THIS GUARANTEE IS EXCLUSIVE AND REPLACES ANY OTHER GUARANTEES, EXPLICIT OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED GUARANTEE AS TO THE SUITABILITY OF THE PRODUCT TO BE SOLD OR APPLIED TO A PARTICULAR PURPOSE OR USE. AOIP S.A.S SHALL NOT BE HELD RESPONSIBLE FOR ANY PARTICULAR INDIRECT, ACCIDENTAL OR CONSEQUENTIAL DAMAGE, NOR ANY CORRUPTED OR LOST DATA, WHETHER AS A RESULT OF AN INFRACTION OF THE OBLIGATIONS OF THE GUARANTEE, OR ON A CONTRACTUAL, EXTRA-CONTRACTUAL OR OTHER BASIS.

Because some countries or states do not permit limitations to an implied condition of guarantee, or the exclusion or limitation of accidental or consequential damage, the limitations and exclusions of this guarantee may not apply to every purchaser. If any condition of this guarantee is considered invalid or inapplicable by a competent court, such a decision will in no way affect the validity or binding nature of any other condition.

Table of contents

CALYS 1000/1200/1500 ..... **33**

A. PERFORMANCE **37**

A.1 SPECIFICATIONS 38
A.2 CALYS 1000/1200 RANGES AND ACCURACIES 40

B. GENERAL FEATURES **42**

B.1 INNOVATIVE DESIGN 42
B.2 FLEXIBILITY 42
B.3 KEYBOARD & DISPLAY 42
B.4 DIGITAL SERIAL INTERFACE 42
B.5 FIRMWARE 42
B.6 SCALE FACTOR & SQUARE ROOT 42
B.7 COLD JUNCTION COMPENSATION 42
B.8 CALCULATED READINGS 42
B.9 TRANSMITTER SIMULATION AND CALIBRATION 42
B.10 FREQUENCY - COUNTS 43
B.11 PROGRAMMABLE SIGNAL CONVERTER 43
B.12 2,3,4 WIRE RESISTANCE THERMOMETER 43
B.13 REMOTE TEMPERATURE PROBE 43
B.14 GRAPHIC MODE 43
B.15 SIMULATION PROGRAMS 43
B.16 POWER SUPPLY 43
B.17 REPORT OF CALIBRATION 43

C. PHYSICAL DESCRIPTION **44**

D. FUNCTIONAL DESCRIPTION **45**

D.1 POWER SUPPLY 45
D.2 OPERATIVE KEYBOARD 45
D.3 INPUT CIRCUIT 47
D.4 MICROCONTROLLER 47
D.5 FIRMWARE 47
D.6 DIGITAL DISPLAY 47
D.7 DIGITAL TO ANALOG CONVERTER 48
D.8 EXTERNAL BATTERY CHARGER OR MAINS LINE OPERATION 48
D.9 DIGITAL INTERFACE 48
D.10 RESISTANCE AND RTD MEASUREMENTS 48
D.11 RESISTANCE AND RTD SIMULATION 49
D.12 THERMOCOUPLES INPUT/OUTPUT CIRCUIT 49

E. PRE-OPERATIONAL CHECK **50**

E.1 UNPACKING 50
E.2 CASE 50
E.2.1 Portable cases *50*
E.2.2 Panel mounting *50*
E.2.3 Table top *50*

F. POWER SUPPLY **51**

F.1 POWER SUPPLY AND RECHARGEABLE BATTERY 51
F.1.1 Charging the battery *51*
F.1.2 How to maximize the life span of the battery *51*
F.2 LINE OPERATION 51

G. ELECTRICAL CONNECTIONS **52**

G.1 WIRING PRACTICE 52
G.2 THERMOCOUPLE WIRES 52
G.3 REMOTE CONNECTIONS 53
G.3.1 External switch input *53*
G.3.2 Rj remote *53*

H. OPERATION & APPLICATIONS **54**

H.1 POWER-ON 54
H.2 CONFIGURATION RESET 54
H.3 NEXT CALIBRATION DATE 54
H.4 DIGITAL DISPLAY ADJUSTMENTS 55
H.4.1 Display backlight *55*
H.4.2 Autolamp mode *55*
H.5 "HELP" KEY 56
H.6 CONFIGURATION REVIEW (STATUS) 56
H.7 GENERAL CONFIGURATION SET-UP 58
H.8 SLOT DISPLAY SWAPPING 59
H.9 CHANNELS SCROLLING 59
H.10 DECIMAL POINT POSITION 60
H.11 AVERAGE MODE 60
H.12 AUTORANGE 60
H.13 ALARM FUNCTION 60
H.14 PARAMETER OR SENSOR SELECTION 61
H.15 SCALE FACTOR MODE SET-UP 61
H.16 TEMPERATURE PARAMETERS SELECTION 62
H.17 RJ FAST MODE SELECTION 63
H.18 RESISTANCE THERMOMETER SELECTION 63
H.19 IN-OUT DATA MEMORY 63
H.20 AUTOSCAN PROGRAM MODE 64
H.21 RAMP PROGRAM MODE 64
H.22 BARGRAPH FUNCTION 65
H.23 SWITCH TEST ROUTINE 65
H.24 OFFSET MODE SET-UP 67
H.25 FREQUENCY I/O 67
H.25.1 Frequency OUT *67*
H.25.2 Frequency IN *67*

H.26 TRANSMITTER SIMULATION 67
H.27 GRAPHIC OPERATIVE MODE 68
H.28 PULSE I/O 69
H.28.1 Pulse OUT *69*
H.28.2 Pulse frequency measurement and counter mode *69*
H.29 PERCENTAGE AND ERROR DISPLAY 70

I. OPTIONS & ACCESSORIES 73

I.1 EXTERNAL PRINTER 73
I.1.1 General recommendation *73*
I.1.2 Printer operations: General *73*
I.1.3 Printer operation: Normal In-Out mode *73*
I.2 DATA LOGGING FUNCTION 74
I.2.1 Printout of memory stored data *76*
I.3 PM200 PRESSURE MODULE 77

J. DIGITAL INTERFACE 78

J.1 DIGITAL OUTPUT WIRING PRACTICE 78
J.1.1 TTL to RS232 adaptor *78*
J.2 COMMUNICATION PROTOCOL FROM CALYS TO A PC 79
J.2.1 Computer data request from Calys *79*
J.2.2 Computer data setting from PC to Calys *86*

K. MAINTENANCE 89

K.1 FAULTY OPERATING CONDITIONS 89
K.2 PROTECTION FUSES 89
K.3 SAFETY RECOMMENDATIONS 90
K.4 STORAGE 90
K.5 EMC CONFORMITY 90

A. PERFORMANCE

Calys 1000/1200 and **Calys 1500** are two insulated channels multifunction calibrators. They are portable and developed to meet all the needs of instrumentation engineers and Quality managers, both in laboratory and in field work.

This units are accurate, rugged, compact and easy to use. They are the ideal solution to simulate and measure: Voltage, current, resistance, thermocouple, resistance thermometers, frequency and pulse.

Advanced flexibility and high performance has been achieved using 32 bit microprocessor and a fast A/D conversion technology. The calibrators memory, has stored inside all data for normalised IEC, DIN and JIS thermoelectric sensors for both IPTS68 and ITS90 International Temperature Scale. The microprocessor performs automatic linearization and cold junction compensation to assure high accuracy. It is possible to set the calibrator to execute menu-driven calibration procedure for your instruments in field work.

Both Channel 1 (Out) and Channel 2 (In) have the following operative mode capability:

- **millivolts**
- **volts**
- **milliamperes (active and passive loop)**
- **ohms**
- **temperature with thermocouples**
- **temperature with resistance thermometers**
- **frequency**
- **pulse**

Remote auxiliary inputs are available for

- **Relative humidity and temperature module**
- **Two internal sensor and built-in hand pump pressure module**

The ergonomic case design allows to use the calibrator in three different ways.

- **Portable** Two different leather cases, with cover and shoulder strap, are available on request for instrument alone or instrument, printer and accessories. These are extremely useful for a practical use since they allow to leave one hand free for instrument tuning.
- **Panel mounting** It requires a panel cutout of 242 x 88 mm. The instrument bezel flange butts against the front of the mounting plate; two lateral mounting brackets fit over the instrument rear panel
- **Table top** The case is equipped with 2 pivot feet to change the vertical viewing angle when using the instrument on the top of a table.

EMC Conformity

The instrument case, made in shock-resistant injection moulded ABS + polycarbonate has an internal metal coating to fulfil the prevision of the directive 89/336/CEE Electromagnetic Compatibility.

HIGHLIGHTS

Calys 1000

- 32-bit microprocessor and flash memory for firmware upgrading through serial interface
- All normalized IEC, DIN, JIS thermocouples
- Pt, Ni, Cu resistance thermometers temperature measurement and active simulation mA, mV, V, □, frequency, pulse, counter
- IPTS 68 and ITS 90 selection directly through keyboard
- Current output mode directly on active or passive loops
- Bidirectional serial interface
- Portable, table top and panel mounting
- Communication bus for extension to pressure and other optional modules
- Optional dedicated external impact type printer
- Traceable Report of Calibration

Calys 1200

- As Calys 1000 with improved performance and accuracy (0.01% rdg)
- Non volatile memory with real-time clock
- Logging and direct real-time graph with movable cursor to read the required actual value

Calys 1500

- As Calys 1200 calibrator with improved accuracy (0.0035% of rdg)
- 7 digit display for improved resolution (up to 0.1μV) for mV and V I/O

A.1 Specifications

- IN/OUT parameters:
  - Signal mV, V, mA, Ω, KΩ, frequency, pulses
  - thermocouples J, K, T, R, S, B, N, C, E, U, L, F, G, D
  - resistance thermometers Pt100 IEC, OIML, USLAB, US, SAMA, JIS Pt200, 500, 1000, 1000 OIML, Ni100, Ni120, Cu10, Cu100
- Reference junction compensation:
  - internal automatic from -10 °C to +55 °C
  - external adjustable from -50 °C to +100 °C
  - remote with external Pt100 from -10°C to +100 °C
- Rj compensation drift:
  - ± 0.015°C/°C (from -10 °C to +55 °C)
- Rj compensation error:
  - internal : ±0.15°C
  - remote : ±0.3°C
- Common mode rejection:
  - >140 dB at ac operation
- Normal mode rejection:
  - >70 dB at 50 or 60 Hz
- Temperature stability:
  - Calys 1000 /200+:
    for temperature exceeding the band +18°C to +28°C (from +64 °C to +84 °F)
    full scale: ± 8 ppm/°C

zero: ± 0.2 µV /°C

- Calys 1500 :

  for temperature exceeding the band +21°C to +25°C (from +70 °C to +77 °F)

  full scale: ± 3 ppm/°C

  zero: ± 0.2 µV /°C

- Output impedance (emf output):
  - < 0.5 Ω with 0.5 mA maximum current
- Input impedance (mV, V and Tc ranges):
  - >10 MΩ
- Input impedance (mA ranges):
  - <140 Ω @ 1 mA
- Source resistance effects:
  - ±1 µV error for 1000 ohms source resistance
- Rtd and Ω simulation excitation current:
  - Calys 1000 /200+: from 0.01 to 5 mA
  - Calys 1500 : from 0.01 to 2 mA
- Rtd and Ω measurement excitation current:
  - ~ 0.4 mA @ 400Ω
  - ~ 0.04 mA @ 4000Ω
- Rtd connection:
  - 2, 3, and 4 wires
- Rtd cable compensation:
  - up to 100 Ω (each wire)
- Rtd cable compensation error (Pt100):
  - ±0.005°C/ Ω of total wire
- Maximum load resistance:
  - 1000 Ω @ 20 mA
- Display:
  - graphic LCD 240 x 64 dots display with LED backlight device
- Measurement sampling time:
  - 250 ms
- Output noise (at 300 Hz):
  - <2 µVpp for ranges up to 200 mV f.s.,
  - <10 µVpp for ranges up to 2 V f.s.
  - <80 µVpp for ranges up to 20 V f.s.
- Digital interface:
  - full bidirectional TTL (a RS232 adapter normal or insulated, is available as an option)
- Channel 1-Channel 2 insulation:
  - 50 Vdc
- Calculation functions:
  - hold, max, min, offset, average
- Selection °C/°F/K:
  - through the configuration procedure
- In/Out data memory:
  - 20 data with manual or automatic recall
- Logging mode:
  - >1500 input data items (optional memory card for memory extension)
- Convert function:
  - displays the electrical equivalent of the engineering unit
- Scale factor:
  - 5 different setting with zero and span programmable within -399999 and +999999
- Square root:
  - in combination with scale factor
- Calibration:
  - self learning technique with automatic procedure
- Power supply:
  - external supply or rechargeable Ni-Cd battery
- Battery life:
  - 6h on Tc and mV input/output (backlight Off)
  - 3.5h with 20 mA simulation (backlight Off)
- Recharging time:
  - 5h at 90% and 6h at 99% with instrument switched off. The battery charging is active only with the instrument switched off.
- Battery charge indication:
  - bar graph on the LCD display
- Line operation:
  - 100 - 120 – 230 Vac with the external battery charger
- Line transformer insulation:
  - 2500 Vac
- Firmware release identification:

- release code on the display

– Operating environment temperature range:
  - from -10 °C to +55 °C (from 14 °C to 131 °F)
– Storage temperature range:
  - from -30 °C to +60 °C (from -22 °C to 140 °F)
– Case:
  - Injection moulded ABS with internal metal coating
– Dimensions:
  - 264 x 96 x 172 mm (DIN size)
– Weights:
  - nett 4 Kg gross 5,5 Kg

A.2 Calys 1000/1200 ranges and accuracies

IN-OUT RANGES

				CALYS 1200	Calys 1000
Sensor or parameter	**Total range**	**High accuracy range**	**Resolution**	**Accuracy (% of reading)**	**Accuracy (% of reading)**
Tc type J	-210 to 1200°C	-190 to 1200°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-350 to 2200°F	-310 to 2192°F	0.1°F	±(0.01% +0.18F)	± (0.02% +0.18 °F)
Tc type K	-270 to 1370°C	-160 to 1260°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	454 to 2500°F	-256 to 2300°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type T	-270 to 400°C	-130 to 400°C	0.01°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-454 to 760°F	-238 to 752°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type R	-50 to 1760°C	150 to 1760°C	0.1°C	±(0.01% +0.2°C)	± (0.02% +0.2 °C)
	-60 to 3200°F	302 to 3200°F	0.1°F	±(0.01% +0.36°F)	± (0.02% +0.36 °F)
Tc type S	-50 to 1760°C	170 to 1760°C	0.1°C	±(0.01% +0.2°C)	± (0.02% +0.2 °C)
	-60 to 3200°F	338 to 3200°F	0.1°F	±(0.01% +0.36°F)	± (0.02% +0.36 °F)
Tc type B	50 to 1820°C	920 to 1820°C	0.1°C	±(0.01% +0.3°C)	± (0.02% +0.3 °C)
	140 to 3310°F	1688 to 3308°F	0.1°F	±(0.01% +0.54°F)	± (0.02% +0.54 °F)
Tc type C	0 to 2300°C	0 to 2000°C	0.1°C	±(0.01% +0.2°C)	± (0.02% +0.2 °C)
	32 to 4180°F	32 to 3632°F	0.1°F	±(0.01% +0.36°F)	± (0.02% +0.36 °F)
Tc type G	0 to 2300°C	190 to 2300°C	0.1°C	±(0.01% +0.3°C)	± (0.02% +0.3 °C)
	32 to 4180°F	374 to 4172°F	0.1°F	±(0.01% +0.54°F)	± (0.02% +0.54 °F)
Tc type D	0 to 2300°C	0 to 2130°C	0.1°C	±(0.01% +0.3°C)	± (0.02% +0.3 °C)
	32 to 4180°F	32 to 3866°F	0.1°F	±(0.01% +0.54°F)	± (0.02% +0.54 °F)
Tc type U	-200 to 400°C	-160 to 400°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-330 to 760°F	-256 to 752°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type L	-200 to 760°C	-200 to 760°C	0.1°C	±(0.01% +0.1°C)	± (0.02% + 0.1 °C)
	-330 to 1400°F	-328 to 1400°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type N	-270 to 1300°C	0 to 1300°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-450 to 2380°F	32 to 2372°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type E	-270 to 1000°C	-200 to 1000°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-454 to 1840°F	-328 to 1832°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Tc type F	0 to 1400°C	0 to 1400°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	32 to 2560°F	32 to 2552°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Pt100 IEC	-200 to 850°C	-200 to 850°C	0.01°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
OIML, 3926	-330 to 1570°F	-328 to 1562 °F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Pt100	-200 to 650°C	-200 to 650°C	0.01°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
a 3902	-330 to 1210°F	-328 to 1210°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Pt100 JIS	-200 to 600°C	-200 to 600°C	0.01°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
SAMA	-330 to 1120°F	-328 to 1112°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Pt 200	-200 to 850°C	-200 to 850°C	0.1°C	±(0.01% +0.15°C)	± (0.02% +0.15 °C)
	-330 to 1570°F	-328 to 1562°F	0.1°F	±(0.01% +0.27°F)	± (0.02% +0.27 °F)
Pt 500	-200 to 850°C	-200 to 530°C	0.1°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
	-330 to 1570°F	-328 to 986°F	0.1°F	±(0.01% +0.18°F)	± (0.02% +0.18 °F)
Pt1000 IEC	-200 to 850°C	-200 to 850°C	0.01°C	±(0.01% +0.1°C)	± (0.02% +0.1 °C)
OIML	-330 to 1570°F	-328 to 1562°F	0.1°F	±(0.01% +0.18°F)	± (0.02 % +0.18 °F)
CU10	-70 to 150°C	-70 to 150°C	0.1°C	±(0.01% +0.4°C)	± (0.02% +0.4 °C)
	-100 to 310°F	-94 to 302°F	0.1°F	±(0.01% +0.72°F)	± (0.02% +0.72 °F)
CU100	-180 to 150°C	-180 to 150°C	0.1°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
	-300 to 310°F	-292 to 302°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Ni100	-60 to 180°C	-60 to 180°C	0.1°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
	-80 to 360°F	-76 to 356°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
Ni120	0 to 150°C	0 to 150°C	0.1°C	±(0.01% +0.05°C)	± (0.02% +0.05 °C)
	32 to 310°F	32 to 302°F	0.1°F	±(0.01% +0.09°F)	± (0.02% +0.09 °F)
mV		-20 to +200mV	1µV	±(0.01% +2µV)	± (0.02% +2 µV)
mV		-0.2 to +2 V	10 µV	±(0.01% +10 µV	± (0.02% +10 µV)
V		-2 to +20 V	0.1mV	±(0.01% +0.08mV)	± (0.02% +0.08 mV)
mA (In)		-5 to +50mA	0.1µA	±(0.01% +0.4µA)	± (0.02% +0.4 µA)
mA (Out)		0 to +50mA	0.1µA	±(0.01% +0.4µA)	± (0.02% +0.4 µA)
Ω IN		0 to 500Ω	1mΩ	±(0.01% +12mΩ)	± 0.02% +12 mΩ)
		0 to 5000 Ω	0.01Ω	±(0.01% +120mΩ)	± (0.02% +120 mΩ)
Ω OUT		0 to 500 Ω	1 mΩ	±(0.01% +20mΩ)	± (0.02% +20 mΩ)
		0 to 5000 Ω	0.01Ω	±(0.01% +200mΩ)	± (0.02% +200 mΩ)
Frequency		1 to 200 Hz	0.001 Hz	±(0.005% +0.001 Hz)	
		1 to 2000 Hz	0.01	±(0.005% +0.001 Hz)	
		1 to 20000 Hz	0.1 Hz	±(0.005% +0.001 Hz)	
Pulse counter		0 to 10^6 counts	1 count	infinie	
Pulse (Out)		0 to 6000 pulse/min	1 pulse/min	1 pulse/min	
		0 to 36000 pulse/h	1 pulse/h	1 pulse/min	

Note:
– The relative accuracies shown above are stated for 360 days and the operative conditions are from +18°C to +28°C
– Typical 90 days relative accuracy can be estimated by dividing the "% of reading" specifications by 1.6.
– Typical 2 years relative accuracy can be estimated by multiplying the "% of reading" specifications by 1.4.
– All input ranges: additional error ±1 digit.

CALYS 1500

Sensor or parameter	Total range	High accuracy range	Resolution	Accuracy (% of reading)
Tc type J	-210 to 1200°C	-190 to 1200°C	0.01°C	±(0.005%+0.1°C)
	-350 to 2200°F	-310 to 2192°F	0.1°F	±(0.005%+0.18F)
Tc type K	-270 to 1370°C	-160 to 1260°C	0.01°C	±(0.005%+0.1°C)
	454 to 2500°F	-256 to 2300°F	0.1°F	±(0.005% +0.18°F)
Tc type T	-270 to 400°C	-130 to 400°C	0.01°C	±(0.005%+0.1°C)
	-454 to 760°F	-238 to 752°F	0.1°F	±(0.005%+0.18°F)
Tc type R	-50 to 1760°C	150 to 1760°C	0.01°C	±(0.005%+0.2°C)
	-60 to 3200°F	302 to 3200°F	0.1°F	±(0.005%+0.36°F)
Tc type S	-50 to 1760°C	170 to 1760°C	0.01°C	±(0.005%+0.2°C)
	-60 to 3200°F	338 to 3200°F	0.1°F	±(0.005%+0.36°F)
Tc type B	50 to 1820°C	920 to 1820°C	0.01°C	±(0.01%+0.3°C)
	140 to 3310°F	1688 to 3308°F	0.1°F	±(0.01%+0.54°F)
Tc type C	0 to 2300°C	0 to 2000°C	0.1°C	±(0.01%+0.2°C)
	32 to 4172°F	32 to 3632°F	0.1°F	±(0.01%+0.36°F)
Tc type G	0 to 2300°C	190 to 2300°C	0.1°C	±(0.01%+0.3°C)
	32 to 4172°F	374 to 4172°F	0.1°F	±(0.01%+0.54°F)
Tc type D	0 to 2300°C	0 to 2130°C	0.1°C	±(0.01%+0.3°C)
	32 to 4172°F	32 to 3866°F	0.1°F	±(0.01%+0.54°F)
Tc type U	-200 to 400°C	-160 to 400°C	0.01°C	±(0.005%+0.1°C)
	-330 to 760°F	-256 to 752°F	0.1°F	±(0.005%+0.18°F)
Tc type L	-200 to 760°C	-200 to 760°C	0.01°C	±(0.005%+0.1°C)
	-330 to 1400°F	-328 to 1400°F	0.1°F	±(0.005%+0.18°F)
Tc type N	-270 to 1300°C	0 to 1300°C	0.01°C	±(0. 005%+0.1°C)
	-450 to 2380°F	32 to 2372°F	0.1°F	±(0. 005%+0.18°F)
Tc type E	-270 to 1000°C	-200 to 1000°C	0.01°C	±(0. 005%+0.1°C)
	-454 to 1840°F	-328 to 1832°F	0.1°F	±(0. 005%+0.18°F)
Tc type F	0 to 1400°C	0 to 1400°C	0.01°C	±(0. 005%+0.1°C)
	32 to 2560°F	32 to 2552°F	0.1°F	±(0. 005%+0.18°F)
Pt100 IEC	-200 to 850°C	-200 to 850°C	0.01°C	±(0.005%+0.05°C)
OIML, 3926	-330 to 1570°F	-328 to 1562 °F	0.1°F	±(0.005%+0.09°F)
Pt100	-200 to 650°C	-200 to 650°C	0.01°C	±(0.005%+0.05°C)
a 3902	-330 to 1210°F	-328 to 1210°F	0.1°F	±(0.005%+0.09°F)
Pt100 JIS	-200 to 600°C	-200 to 600°C	0.01°C	±(0. 005%+0.05°C)
SAMA	-330 to 1120°F	-328 to 1112°F	0.1°F	±(0. 005%+0.09°F)
Pt 200	-200 to 850°C	-200 to 850°C	0.01°C	±(0.005%+0.15°C)
	-330 to 1570°F	-328 to 1562°F	0.1°F	±(0.005%+0.27°F)
Pt 500	-200 to 850°C	-200 to 530°C	0.01°C	±(0.005%+0.1°C)
	-330 to 1570°F	-328 to 986°F	0.1°F	±(0.005%+0.18°F)
Pt1000 IEC	-200 to 850°C	-200 to 850°C	0.01°C	±(0.005%+0.1°C)
OIML	-330 to 1570°F	-328 to 1562°F	0.1°F	±(0.005%+0.18°F)
CU10	-70 to 150°C	-70 to 150°C	0.1°C	±(0.01%+0.4°C)
	-100 to 310°F	-94 to 302°F	0.1°F	±(0.01%+0.72°F)
CU100	-180 to 150°C	-180 to 150°C	0.1°C	±(0.01%+0.05°C)
	-300 to 310°F	-292 to 302°F	0.1°F	±(0.01%+0.09°F)
Ni100	-60 to 180°C	-60 to 180°C	0.1°C	±(0.01%+0.05°C)
	-80 to 360°F	-76 to 356°F	0.1°F	±(0.01%+0.09°F)
Ni120	0 to 150°C	0 to 150°C	0.1°C	±(0.01%+0.05°C)
	32 to 310°F	32 to 302°F	0.1°F	±(0.01% +0.09°F)
mV		-20 to +200mV	0.1µV	±(0.0035% +1µV)
mV		-0.2 to +2 V	1 µV	±(0.005%+10 µV
V		-2 to +20 V	10mV	±(0.005%+0.08mV)
mA (In)		-5 to +50mA	0.1µA	±(0.005%+0.4µA)
mA (Out)		0 to +50mA	0.1µA	±(0.005%+0.4µA)
Ω IN		0 to 500 Ω	1mΩ	±(0.005%+12mΩ)
		0 to 5000 Ω	0.01Ω	±(0.005%+120mΩ)
Ω OUT		0 to 500 Ω	1 mΩ	±(0.005%+12mΩ)
		0 to 5000 Ω	0.01Ω	±(0.005%+120mΩ)
Frequency		1 to 200 Hz	0.001 Hz	±(0.005% +0.001Hz)
		1 to 2 Hz	0.01	±(0.005% +0.001Hz)
		1 to 20 Hz	0.1 Hz	±(0.005% +0.001Hz)
Pulse counter		0 to 10^6 counts	1 count	infinie
Pulse (Out)		0 to 6000 pulse/min	1 pulse/min	1 pulse/min
		0 to 36000 pulse/h	1 pulse/h	1 pulse/min

Note:

- The relative accuracies shown above are stated for 360 days and the operative conditions are from +18°C to +28°C
- Typical 90 days relative accuracy can be estimated by dividing the "% of reading" specifications by 1.6.
- Typical 2 years relative accuracy can be estimated by multiplying the "% of reading" specifications by 1.4.
- All input ranges: additional error ±1 digit.

B. GENERAL FEATURES

B.1 Innovative design

Calys calibrators use innovative electronics based an a powerful 32 bit microcontroller and sophisticated high stability, low level signal, thermal e.m.f. free analog circuit. A Flash memory allows firmware updating through serial interface and modem.

Calys 1200 and **Calys 1500** incorporates a real time clock, PCMCIA Memory Card slot and improved performances.

B.2 Flexibility

The operative set-up mode is simplified by a sequence of menu pages that only require <**Select**> and <**Enter**> instructions. A full set of operators notes are memory stored allowing a direct operator's assistance and instructions. Any relevant instruction may be recalled through the <**Help**> key. Separate terminals for Channel 1 and Channel 2 are installed on the front panel. The instrument accepts 2, 3, 4 wires resistance termometers.

B.3 Keyboard & Display

A thermoformed metal-click polycarbonate membrane keyboard, with a working life of one million operations per key, seals the internal electronics from the surrounding environment.

Contact closure of the membrane keys is acknowledged as a coded signal directly by the microprocessor.

The setting of the simulation signal value uses the typical **AOIP sas** in-line single digit setting mode or a direct numerical entry mode.

The ligh contrast LCD graphic display, equipped with a backlight device, allows easy reading even in poor light conditions.

The graphic display allows a simultaneous indication of the measured and simulated value (large digit), together with a comprehensive number of messages related to engineering units, type of sensor or signal, temperature scale, cold junction selection and battery level of charge.

A backlight auto power OFF mode is installed to save battery life.

A swap feature is also installed to change the position on the display of the IN and OUT parameters.

B.4 Digital serial interface

It is a full bidirectional TTL level digital interface for communication with computerized systems.

A RS232 adaptor with galvanic insulation is available on request.

B.5 Firmware

The real time clock, Flash Memory and RAM handle logic functions, mathematical computation and data storage.

The firmware includes the following capabilities:

- multiple measurements and generation mode
- signal processing: filter, average, peak, alarms
- downloadable test procedure (CalpMan)
- data acquisition (LogMan)
- switch test routine
- ramping and stepping for dynamic testing
- user definable linearisation (LinMan)
- user entry of probe specific calibration coefficients (LinMan)

B.6 Scale factor & Square root

All non temperature ranges are fully programmable to read both measured and output values in term of engineering unit.

Four characters, adjustable in an alphanumeric way, are available on the display to show the symbol of the parameter (i.e. mbar, % RH, % CO, etc.) mA reading and output can be eg. related to flow when using a ΔP transmitter across a calibrated flange.

B.7 Cold Junction compensation

Accurate and fast response automatic internal Rj compensation through a special low thermal capacity design of binding posts incorporating a thin film high accuracy Pt100.

The cold junction temperature is measured, acknoledged by the microprocessor, directly displayed for automatic Rj compensation.

In addiction to the automatic internal Rj compensation two alternative compensation modes can be selected: "external" with a programmable temperature value or "remote" automatic with an external resistance thermometer.

B.8 Calculated readings

To allow measurements of unstable input signals by a programmable averaging of a programmable number of conversions and min and max value identification.

A "hold" function is also present on the keyboard or external contact instructions.

B.9 Transmitter simulation and calibration

The instrument can be connected to system inputs to simulate a 4-20 mA transmitter. It has an adequate power to drive 20 mA into a load of 1000 Ω in the source mode (50 mA su 350 Ω). The operator can set and change temperature values while obtaining the equivalent mA output.

The mA mode may be connected directhy either on passive or on active loops.

B.10 Frequency - Counts

The "Out" mode is designed to generate zero based pulses, with an adjustable amplitude, at a frequency up to 20 KHz.

A preset number of pulses may be programmed and transmitted to test or calibrate totalizers and counters.

The instrument can be configured to measure frequency and count pulse (totalizer mode). Technical units in Hz, pulse/h and pulse/min. The input threshold is adjustable from 0 to 20 V with 0.01 V resolution.

B.11 Programmable signal converter

The instrument can be used as a temporary signal convert replacement. Any input signal (including the remote auxiliary inputs) can be converted into any of the available output signals while maintaining full galvanic isolation.

B.12 2,3,4 wire resistance thermometer

Although resistance and temperature with resistance thermometer may be measured on a 2, 3 wire connection, the instrument is also designed for 4-wire measurements with a resolution as low as 0.01°C.

B.13 Remote temperature probe

A high accuracy probe is available on request for general purpose temperature measurement and/or remote cold junction compensation.

B.14 Graphic mode

To obtain a real time graph of the measured parameter.

The input data are memory stored and the actual values, relevant to the required time, can be digital displayed using the cursor key.

B.15 Simulation programs

Menu-driven set up to generate:

- a continuous or step ramp output where the total time, the starting point, the final point and the size of the steps are requested by the set-up procedure to run the program;
- a repeatitive programmable cycle rises, soaks, falls;
- a manual requested increment through keyboard;
- an automatic sequence of up to 20 stored values (2 groups of 10 memories).

B.16 Power supply

External charger circuit and internal rechargeable battery. The instrument can operate from mains line continuously without removing the battery. When in normal operation from mains supply the battery is not recharged. To recharge the battery the instrument must be switched off.

B.17 Report of Calibration

Each instrument is factory calibrated against AOIP sas Standards, that are periodically certified by an International recognized Laboratory to ensure traceability, and shipped with a Report of Calibration stating the nominal and actual values and the deviation errors.

A special calibration report can be supplied on request.

C. PHYSICAL DESCRIPTION

The **Calys 1xxx** series calibrator consists of a rugged and compact case, a mother board with all base and IN/OUT circuits, a tactile polycarbonate membrane keyboard, a LCD display and a group of four Ni - Cd rechargeable batteries.

The internal surface of the case is metal coated through a special process to improve the characteristics of electrical noise shielding and thermal equalization of all internal circuits.

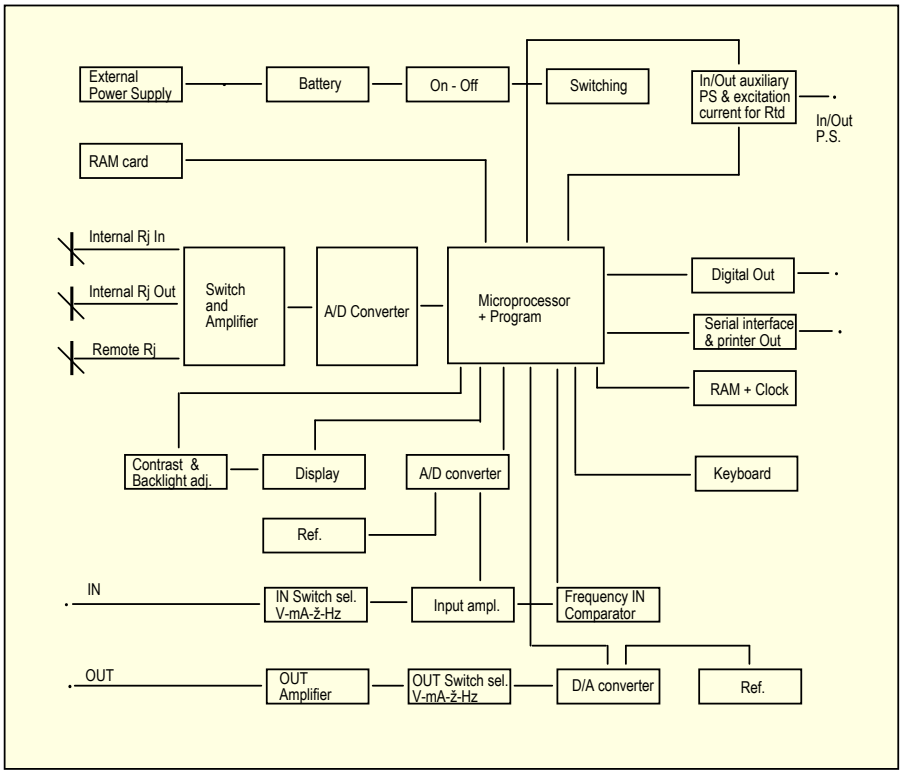
On the **Calys 1xxx** series the battery container is located on the upper part of the case, and it is accessible through a cover with two fasteners.

The two sections of the case are joined together and fastened by five metal screws located on the botton part of the case.

The optional leather case, with shoulder strap, assures better protection of the instrument against mechanical knocks or scratches.

D. FUNCTIONAL DESCRIPTION

The calibrator functional block diagram is shown below.



- **external power supply module**
- **microprocessor (central unit + program)**
- **input circuit**
- **reference junction compensators (Rj)**
- **LCD display**
- **operative keyboard**
- **analog to digital converter**
- **digital to analog converter**
- **auxiliary power supply at 24 Vdc**
- **RAM + Clock (optional on Calys 1000 , standard on Calys 1200 and Calys 1500)**

D.1 Power supply

The instrument is powered by a group of four internal rechargeable Ni-Cd batteries.
The battery is charged through an external power supply module.
When required the instrument can be powered directly from the mains line without removing the batteries.
Pressing the **<ON>** key you will provide the dc voltage levels for the circuitry of the instrument:

IN Circuits

+ 24 V	analog circuit
+ 5 V	digital/analog circuit
-10 V	analog circuit
.....	auxiliary power supply In

OUT Circuits

+ 24 V	analog circuit
+ 5 V	digital/analog circuit
- 5 V	analog circuit
- 10 V	analog circuit
.....	auxiliary power supply Out

Two separate groups of voltage levels respectively for Channel 1 and Channel 2 circuits.
A galvanic insulation of 250 Vac is present between the two group of voltage levels.

D.2 Operative keyboard

million operations per key.
The contact closure of the membrane keyboard is acknowledged as a coded signal by the microprocessor that recognizes the operators' instructions .
The ergonomics are simplified with a reduced number of instruction keys referring to the display for additional set-up instructions.

Ch-IN	IN terminals
Ch-OUT	OUT terminals
ON	Power ON switch
OFF	Power OFF switch
STO	Memory load
RCL	Memory data recall
←→	Parameter scanning during selection or decimal point position setting
0……9	Single digit setting, numerical entry, parameter scanning during selection, IN/OUT memories
SELECT	Operative menu-driven set-up
±	Polarity simulation setting or parameter scanning during selection
,	Decimal point simulation setting
IN/OUT	Abilitates IN/OUT configuration set-up
MENU	Scrolling of auxiliary operative modes
ENTER	Memory load - Operator's message acknowledgement
SHIFT	Key secondary function
STATUS	To view the pages of the actual installed operative mode and of memory stored data
HELP	Operator's instruction menu pages
NUM	Direct numerical setting of the simulated value
LAMP	To switch the display backlight
RAMP	To start the simulation program
	IN and OUT displaying position swapping
ENTER + <4> or <9>	Display contrast adjustment
ENTER + <±> or <,>	Display backlight intensity adjustment

D.3 Input circuit

The A/D converter is a monolithic 20 bit ADC which uses a sigma delta conversion technique.

The analog input is continuously sampled by an analog modulator whose mean output duty cycle is proportional to the input signal.

The modulator output is processed by an on-chip digital filter with a six-pole Gaussian response, which updates the output data register with 20-bit binary words at word rates up to 4 kHz. The sampling rate, filter corner frequency and output word rate are set by a master clock input supplied externally from a dedicated quartz with frequency multiple of 50/60 Hz to improve noise rejection.

The inherent linearity of the ADC is excellent (0.003%), and the endpoint accuracy is ensured by a self-calibration of zero and a full scale which is started every 5 minutes.

The self-calibration scheme can also be extended to null system offset in the input channel.

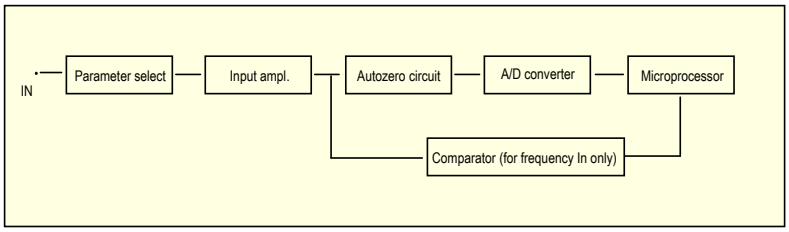
Output data are accessed through a serial port by the microprocessor in a synchronous mode.

CMOS/HCCMOS construction ensures a low power dissipation and high speed.

Analog switches provide for the gain and input parameter selection.

The front end amplifier is a high performance amplifier with very low noise and zero-drift with a combination of low-front-end noise and dc precision and it is followed by an autozero circuit.

The internal nulling clock is set at 5 KHz for an optimum low frequency noise and offset drift.



D.4 Microcontroller

The microprocontroller handles all the logic functions of the instrument, performs the linearization for non linear transducers, compensates for the reference junction temperature, drives the digital display and acknowledges all the operator's instructions.

The core of the circuit is the MC68332; a 32 bit integrated microcontroller, combining high performance data manipulation capabilities with powerful peripheral subsystems and featuring a fully static, high speed complementary metal oxide semiconductor (HCMOS) technology.

The MC68332 contains intelligent peripheral modules such as the time processor unit (TPU), which provides 16 microcoded channels to perform time related activities from a single input capture or output compared to sophisticated pulse width modulation (PWM).

High speed serial communications are provided by the queued serial module (QSM) with available syncronous and asyncronous protocols.

Two kilobytes of fully static standby RAM allow a fast two cycle access for system and data stacks and for variable storage with provision for battery back-up.

Twelve chip selections enhance system integration for fast external memory or peripheral access.

These modules are connected on-chip via intermodule bus (IMB)

D.5 Firmware

The operating firmware system (256 Kbyte memory) is divided in to two sections:

- one section contains the **boot-loader** that is a routine to enable the base firmware loading through the serial port
- the second section contains **the base firmware** that handles all logic instructions for internal peripheral circuits and performs the computation of the linearization equations. Moreover it contains the **"Help"** key operator's instructions and gives instructions to the secondary graphic controller for the character generation.

The application system firmware (eg. calibration data) is resident on a non-volatile ”Flash” EPROM.

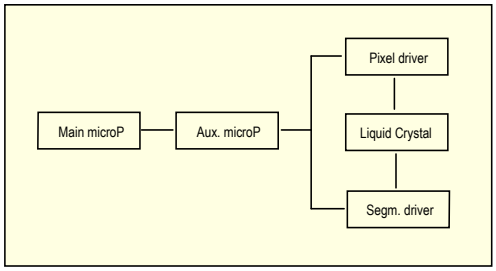
It is used to store the installation parameters (calibration data, simulation program data, etc.)

D.6 Digital display

The Liquid Crystal Display module is a graphic display with high contrast and a wide viewing angle.

It is equipped with a LED backlight device to allow easy readings also in poor light conditions.

The character generation is made through the main microprocessor that gives pertinent instructions to a secondary microprocessor driving the display in a graphic mode.



D.7 Digital to analog converter

The D/A converter is based on a joint configuration, with a partial overlapping, of a 10-bit and 12-bit converter to obtain a ±21 bit resolution .

The two digital to analog converters are designed using the two PWM (pulse with modulation) processes available in the micrprocessor chip.

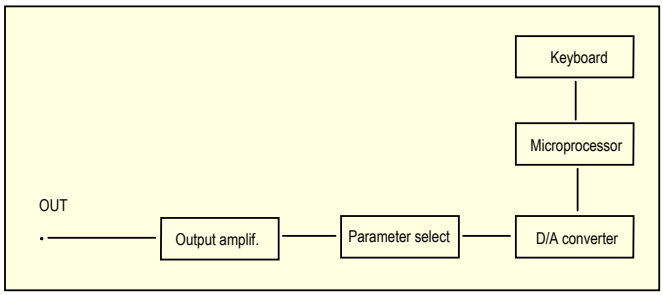
These two PWM outputs drive the relevant switches to generate a voltage output proportional to Ton or Toff with an accuracy theoretically absolute.

The resultant ±21 bit D/A device, driven directly by the microprocessor, converts the digital value of the selected parameter into an analog voltage output function of the time modulation of the PWM and of the internal high stability, high accuracy reference.

Analog switches are used to select one of the following six available output values as a function of the selected range:

-20	to	+200	mV
-2	to	+20	V
-200	to	+2000	mV
0	to	500	Ω
0	to	5	K Ω
0	to	50	mA

The above signal, through an output buffer, is sent to an integrated circuit that will generate the voltage or current requested by the operator's keyboard settings.



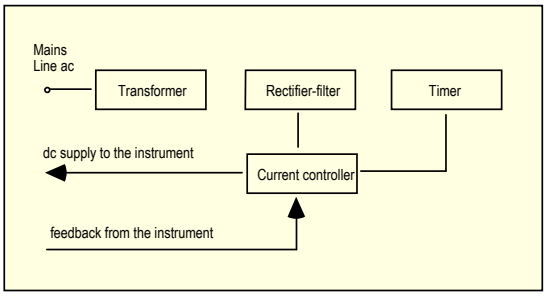
D.8 External battery charger or mains line operation

The instrument is equipped with an external power supply module for line operation 100, 120, 240 Vac 50/60 Hz.

The external power supply module uses a step down transformer, a rectifier, a filter, a serial current controller, protection sections for overcurrent and a battery charge circuit equipped with a timer for three different ways of charge driven by the battery status.

The charging circuit uses two different references for:

- voltage control to 5.5 Vdc during instrument operations (5 V dc internal lines)
- battery charge current controller with a maximum of 1 Adc (when the instrument is switched Off) and a maximum of 1.8 A , limited to 5.5 V with the instrument switched On.



D.9 Digital interface

The serial digital interface circuit is essentially based on the serial communication interface subsystem (SCI) on the chip of the microprocessor (0 to +5V level).

An external adaptor is available on request to convert TTL to RS 232 voltage levels .

D.10 Resistance and Rtd measurements

The instrument can measure temperature with 2, 3 or 4 wire resistance thermometers.

For the 2 and 4 wire resistance thermometers the method used is a special configuration of a potentiometric circuit where a constant current is injected from terminals "I+" and "I-" and the voltage drop accross the thermometer is measured and converted in engineering unit.

With 3 wire thermometers a current equivalent to that generated on terminal "I+" is injected on terminal "V-" to compensate for connecting cable unbalance.

A O---- I +
B O---- V +
C O---- V -
D O---- I -

D.11 Resistance and Rtd simulation

This line of calibrators is equipped with a proprietary electronic circuit for the active simulations of platinum resistance thermometers, nickel resistance thermometers, copper resistance thermometers and resistances.

It is based on the assumption that the instrument to be calibrated will supply the excitation current to the sensor; this current must be between 0.1 and 2 mA for up to 100 Ω nominal value Rtd and between 0.01 mA and 0.5 mA for Pt1000 and K Ω ranges.

A lower value will cause a lower accuracy level and a higher current will not allow the simulation of high resistance values (the maximum voltage drop on the simulated resistance is 2.5 V).

The excitation current must be applied to the pertinent terminals as indicated in par. 7.1 (simulation).

The measured current is converted to voltage through an inverting amplifier and used as a reference for the digital to analog converter.

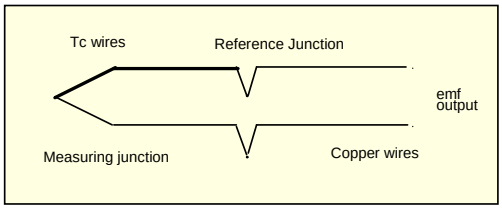
The output amplifier will simulate the variation of the output resistance as a function of the value set by the operator through the keyboard.

D.12 Thermocouples input/output circuit

A thermocouple is a temperature sensor that in its most common form, consists of two wires of different composition, joined together at one end ("measuring" junction).

The two free ends of the thermocouple must be kept at the same known temperature. These joints are , by definition, the "reference" junction (Rj).

The reference junction is also often, but less preferably, called the "cold" junction.



The temperature of the reference junction can be held constant or its variation can be electrically compensated in the associated measuring instrumentation.

A thermocouple is useful for temperature sensing because it generates a measurable electrical signal.

The signal is proportional to the difference in temperature between the measurement and the reference junctions and it is defined, by means of tables, based on the International Temperature Scale.

The **Calys 1xxx** series has the reference junction located in the negative (black) terminal post. To improve overall accuracy the terminals are designed with a very low thermal capacity.

Inside the body of the negative terminal it is placed a thin film Pt100 resistance thermometer that dynamically measures, with high accuracy and 0.01°C resolution , the temperature of the reference junction.

The microprocessor uses the above signal (Pt100) to adjust the input signal to compensate for the Rj temperature.

Reference junction compensation can be internal, external or remote, depending upon the application requirements.

E. PRE-OPERATIONAL CHECK

E.1 Unpacking

Remove the instrument from its packing case and remove any shipping ties, clamps, or packing materials.

Carefully follow any instructions given on any attached tags.

Inspect the instrument from scratches, dents, damages to case corners etc. which may have occurred during shipment.

If any mechanical damage is noted, report the damage to the shipping carrier and then notify **AOIP sas** directly or its nearest agent, and retain the damaged packaging for inspection.

A label, on the back of the instrument case, indicates the serial number of the instrument. The serial number is also shown in the display.

Refer to this number for any inquiry for service, spare parts supply or application and technical support requirements.

AOIP sas will keep a data base with all information regarding your instrument.

E.2 Case

The instrument case, made in shock-resistant injection moulded ABS has an internal metal coating for electric interference protection. It allows the use of the instrument in three different ways:

- portable with leather case for an easy transport
- table top with tilting feet
- panel mounted (DIN cut-out)

A leather protection case is supplied as an option only on request.

E.2.1 Portable cases

Two different leather cases, with cover and shoulder strap, are available on request for the instrument alone or instrument, printer and accessories. These are extremely useful for a practical use since they allow to leave one hand free for instruments under test tuning.

Catalog n. BB880015 is used with the instrument alone while catalog n. BB880011 has a zoom for the instrument, printer and accessories.

E.2.2 Panel mounting

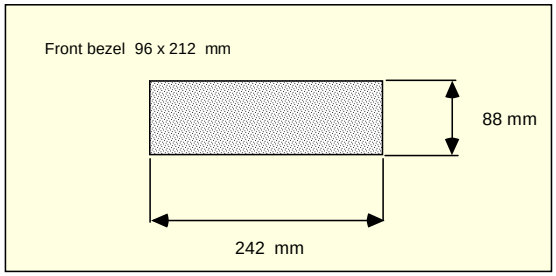
For panel mounting each instrument is supplied with two mounting brackets to be installed on the two sides of the case.

The instrument bezel flange butts against the front of the mounting plate; the mounting brackets fit over the instrument rear panel.

The bracket screws force it against the rear of the mounting panel, locking the instrument in place.

Panel cut-out dimensions are 242 x 88 mm (max. panel thickness 6 mm).

Rack mounting adaptors (112 x 433 mm) are available with openings for two instruments.



E.2.3 Table top

The case is equipped with 2 pivot feet to change the vertical viewing angle when using the instrument on the top of the table.

F. POWER SUPPLY

F.1 Power supply and rechargeable battery

The **Calys** calibrator is powered by four built-in rechargeable batteries. The instrument is shipped with an average level of charge.

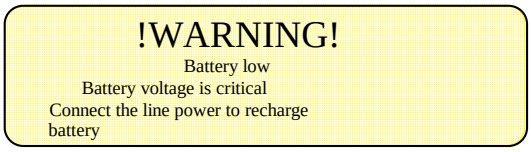
Note: After unpacking, a full charge of the batteries is recommended; connect the instrument to the charger module ("Off" condition) for a period of 8 hours minimum. Energize the display backlight device only in poor light conditions to limit battery discharge.

The Ni-Cd rechargeable batteries do not suffer when used in cyclic operations.

The cyclic operation is understood as a method of operation by which the battery is continually charged and discharged.

Avoid leaving the instrument, with batteries totally or partially discharged, for a long time without recharging. In case of "low battery" (voltage lower than 4.6 V) the display will show the warning message indicated below and an acoustic signal (internal buzzer) will inform the operator that he has only few additional minutes of operation and then the battery should be recharged.

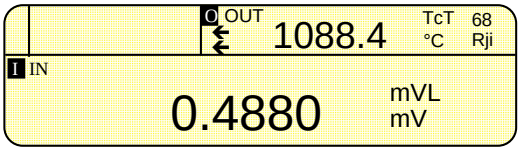
At "low battery" condition the display shows a small battery symbol.



F.1.1 Charging the battery

Battery is only partially charged at the time of purchase. Therefore charge it before using your calibrator.

A total discharge of the battery before recharging it , will allow the battery to be charged to its highest capacity. When not in use, the battery slowly discharges. When not in use for a long period, the battery may be completely discharged.The battery self-discharge time is minimum 2, maximum 6 months it depends, upon battery efficiency and environment conditions.



A "plug" symbol on the upper-left side of the display indicates that the battery charging process is active.

A -red- LED, inside the battery charger module, indicates that the charging process is active. A -green- LED, inside the battery charger module, indicates that the power supply is connected.

! ! WARNING ! !

IF THE BATTERIES ARE COMPLETELLY DISCHARGED, YOU HAVE TO RECHARGE IT WITH THE UNIT SWITCHED OFF.

A FULL BATTERY CHARGE IS OBTAINED IN 4 HOURS AT 90% WITH THE INSTRUMENT SWITCHED OFF.

WHEN OPERATING THE INSTRUMENT WITH LINE POWER SUPPLY, THE BATTERY CHARGE LEVEL IS LIMITED TO 50% MAXIMUM.

F.1.2 How to maximize the life span of the battery

Disconnect the external module from ac mains supply when the battery is charged. Use the battery until it is completely discharged. Note that the operating time decreases at low temperatures.

A Ni-Cd battery can be recharged about 500 times when used following the recommended instructions.

When replacing the Ni-Cd batteries with a new set always replace simultaneously the four pieces.

For long period of storage it is also recommended to keep the instrument at temperatures below 40°; higher temperatures accelerate the battery self discharging process and derate battery performances.

F.2 Line operation

The external power supply module allows direct mains line operations without the battery removal. The battery level of charge is kept at approximately 50% of the full charge. If the line power is connected with batteries completely discharged, these will not recharged with the instrument is switched on.

The symbol will appear on the upper left side of the display. The external power supply module can be configured for line voltage of 100, 120, 240 V ±10% 50/60 Hz.

G. ELECTRICAL CONNECTIONS

Appropriate extension wires should be used between the thermocouple (or instrument under calibration) and the **Calys 1000** unless the thermocouple leads permit direct connection.

Make sure that both thermocouple and compensating cable are connected with the correct polarity.

If in doubt, the polarity of the compensating leads can be checked by connecting a length of lead to the indicator, shortening the free ends of the wires together and noting that the indicator reading increases when the wire connection is heated.

Colour codes of compensating cables change in different countries. Check the appropriate table.

For Rtd connection use a cable of adequate gauge to lower the overall input resistance.

The use of a cable with a good resistance balance between conductors is also necessary.

G.1 Wiring practice

Although the **Calys 1000/1200** and **Calys 1500** calibrators are designed to be insensitive to transients or noise, the following recommendations should be followed to reduce ac pick up in the signal leads and to ensure a good performance. The input leads should not be run near ac line wiring, transformers and heating elements.

Input/output leads should, if possible, be twisted and shielded with the shield grounded at the end of the cable.

When shielded cables are used the shield must be connected to the negative terminal.

For a better undestanding of the appropriate connection when using the instument to simulate current into industrial 2 wire loop please, note the meaning of the terminal used.

Passive loop

This type of connection is to be used when the external loop is not equipped with the loop power supplied.

The calibrator can be, as an example, connected directly to a recorder, controller, etc. with input circuits configured for current measurements.

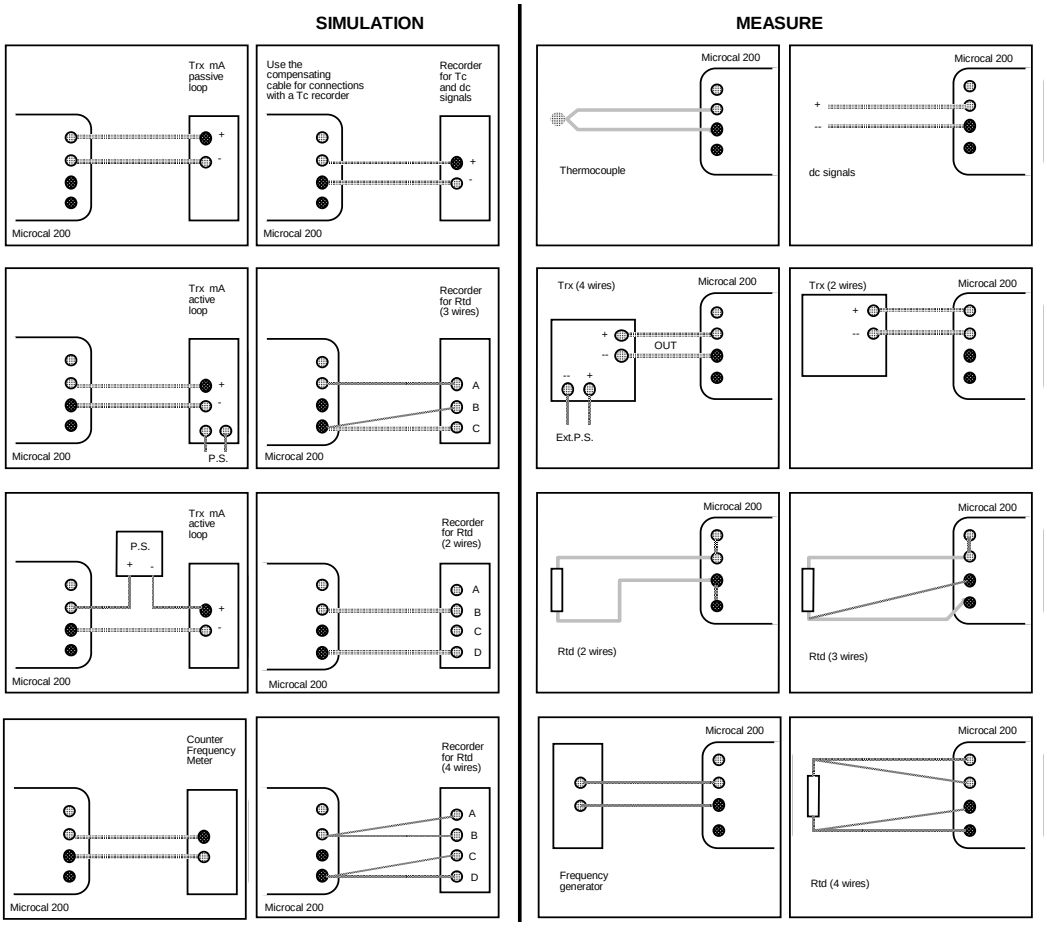
Active loop

This type of connection must be used when the external loop is equipped with its loop power supplied.

The power supply is not required to be disconnected.

The loop circuit must be opened and the **Calys 1000/1200 and Calys 1500** connections are placed in series on the loop.

The following figure shows some examples of input/output wiring of the instrument:



G.2 Thermocouple wires

When making measurements where additional wires have to be connected to the thermocouple leads, care must be exercised in selecting these wire types, not only when they are claimed to be of the same composition as the thermocouples involved, but, also, of their same "quality".

Performance results, where high precision is required and in circumstances where some types of thermocouple wire leads are added to the original installation, should be reviewed carefully for the impact of the choice of the additional wire leads.

The quality of the thermocouple wire is established by the limit of error to be expected with its use.

There are three recognized levels of quality:

- Special or Premium grade
- Standard grade
- Extension wire grade

The error limits determining the grade quality differ from thermocouple type to thermocouple type, reflecting the degree of difficulty in maintaining the precise levels of purity of the metal used.

The table below summarizes the error limits for Premium and Standard grades, while the Extension Grade wire is characterized by limits of error exceeding those in the table.

Errors up to ±2.5 °C may be experienced when using Extension grade thermocouple wire for J and K thermocouples.

Thermocouples Limit of Error

The tolerance and the e.m.f. versus temperature reference table are defined by the IEC 584-2(Cenelec HD 446,2) and listed as it follows:

Tolerance is meant as the maximum deviation, in °C, from the above indicated reference table with reference Junction at 0°C and the measuring junction at an appropriate temperature.

The range indicated is the temperature limit for the indicated relative errors.

Reference junction at 0 °C.

Tc	Class 1	Class 2	Class 3
type T T range	± 0.5°C (-40 to +125°C) ± 0.004 . T (T >125°C) -40 to +350°C	± 1°C (-40 to 133°C) ± 0.0075 . T (T >133 °C) -40 to +350°C	± 1°C (-67 to 40°C) ± 0.015. T (T <-67°C) -200 to 40°C
type E T range	± 1.5°C (-40 to 375°C) ± 0.004.T (T >375°C) -40 to 800°C	± 2.5°C (-40 to 333 °C) ± 0.0075.T (T >333°C) -40 to 900°C	± 2.5°C (-167 to +40°C) ± 0.015.T (T <-167°C) -200°C to 40°C
type J T range	± 1.5°C (-40 to 375°C) ± 0.004.T (T >375°C) -40 to 750°C	± 2.5°C (-40 to 333 °C) ± 0.0075.T (T >333°C) -40 to 750°C	
type K & N T range	± 1.5°C (-40 to 375°C) ± 0.004.T (T >375°C) -40 to 1000°C	± 2.5°C (-40 to 333 °C) ± 0.0075.T (T >333°C) -40 to 1200°C	± 2.5°C (-167 to +40°C) ± 0.015.T (T <-167°C) -200°C to 40°C
type R & S T range	± 1°C (0 to 1100°C) ± 1 + 0.003 (T-100) (T >1100°C) 0 to 1600°C	± 1.5°C (-40 to 600 °C) ± 0.0075.T (T >600°C) 0 to 1600°C	
type B T range		 ± 0.0025.T (T >600°C) 600 to 1700°C	± 4°C (600 to +800°C) ± 0.005.T (T>800°C) 800 to 1700°C

Special selected premium grade wires are available on request.

G.3 Remote connections

G.3.1 External switch input

The instrument is equipped with a contact switch programmable for several functions

The type and mode of the event can be programmed (see par. 8.6) for operations:

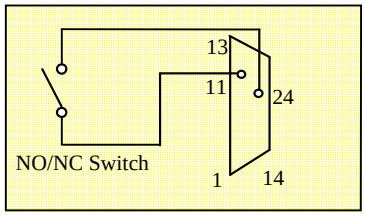
Cnct Fnct = none / hold In / hold InP / ons IN / ons OUT /swtc In / swtc InP / swtc OUT

When the "Contact" function is selected the type of contact should be programmed as it follows:

Cnct STATE = n. open (normally open)

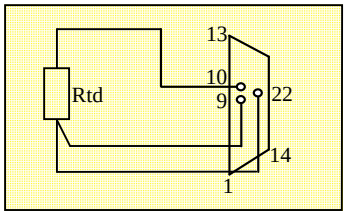
Cnct STATE = n. closed (normally closed)

The remote contact must be wired to the pin 11 (Contact +) and 24 (Contact -) of the back panel connector.



G.3.2 Rj remote

The instrument can also operate with a remote cold junction (Rj) compensation. This operative mode require an external Pt100 to be wired to pin 9 (Rj rem B) and 22 (Rj rem C) and pin 10 (Rj rem A) of the back panel connector as indicated in the figure/table below.



H. OPERATION & APPLICATIONS

The **Calys 1000/1200** and **Calys 1500** calibrators have been factory calibrated before shipment.

During the start-up the operator should only select and load the required application parameters as described below.

If the instrument has been manufactured with a special thermocouple linearization, and/or with a special hardware, see also notes in the Appendix.

The instrument should be used in environments where the temperature does not exceed the specified limits (from -10 °C to +55 °C) and where the relative humidity is lower than 95%

Note: All numeric values showin in the figures of this manual are listed as an example.

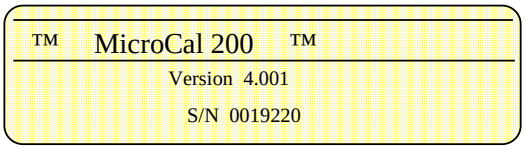
During the set-up and memory loading remember that the instructions of the manual related to key operation have the following meaning:

- **<A> + <B>** Press the **<A>** key and keeping the pressure on it, press then the **<B>** key.
- **<A>, <B>** Press in sequence first the **<A>** key and then the <B> key.

If an operative message (eg. "Instrument config", "Set", "Esc", etc.) is present under the **<NUM>** or **<LAMP>** or **<RAMP>** key this instruction can be entered pressing the corresponding key.

H.1 Power-ON

To power the instrument on press the <ON> key; the following indication will appear for few seconds.



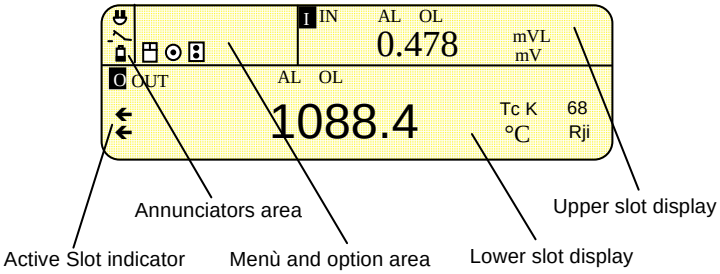
The instrument will run an autodiagnostic routine for the self-checking of critical circuits and components.

The serial number, the version number of the firmware installed on the instrument and the next calibration date are important peaces of information for servicing activities.

To achieve a better performance in terms of accuracy wait at least for 5 minutes for the instrument to warm up.

When possible avoid using the display backlight in order to save the charge of the battery and to limit the heating inside the instrument, so that you can obtain the most accurate results.

The instrument is ready for measurement with the previously selected operating mode with, for example, the following indication:



The **Calys 1000/1200** and **Calys 1500** are able to visualize simultaneously on the display, two of the three I/O cannels : pressure input (InP), signal Input (IN) and signal output (OUT). Make reference to par. 8.8 and 8.9 for scrolling and swapping operations among the channels.

All the keyboard operations are performed on the active slot display. To activate the desidered slot display, press the <In-Out> key in order to visualize the two arrow indicator on the slot.

Some graphical symbols could be displayed on the 'annunciators area' or in the 'option area' of the display. They have special meanings.

These symbols are :

RAM card (PCMCIA) inserted

Low battery indication

Pump vacuum mode selected

Pressure module connected

Switch input status

The external battery charger unit is connected to the mains line

H.2 Configuration Reset

It is possible to reset **Calys 1000/1200** and **Calys 1500** to the **AOIP sas** standard configuration pressing <**RCL**> + <**Help**> keys. The instrument will ask to confirm the operation before to reset the instrument. All operator's setting and data will be lose.

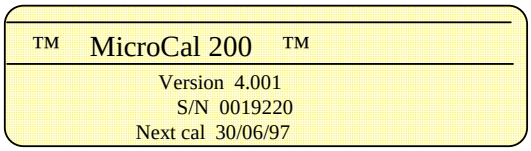
H.3 Next Calibration date

The instrument is equipped with a function to warn the operator when a new calibration of the instrument is recommended .

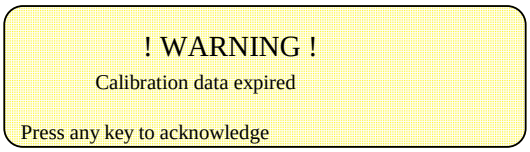
By default the next calibration date is factory set at 01/01/80: this date set-up must be used when the warning message is not required.

The "next calibration date" warning is enabled when the relevant date is programmed in the calibration set-up procedure.

When the instrument is powered, during the diagnostic routine, the following page is displayed with the indication of the next programmed calibration date in the bottom line.



When the programmed next calibration date has expired the instrument, at the start-up, will warn the operator with an acoustic signal and the following message:



Press any key to acknowledge the warning message and to enter the operative mode.

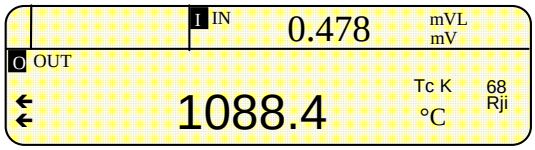
The operator should inform the pertinent service of the organization charged for the instrument recalibration.

H.4 Digital display adjustments

The digital display is a graphic LCD module with ligh contrast and a wide viewing angle.

It is equipped with a LED backlight device to allow easy reading also in poor light conditions.

Different character sizes are used to differentiate the measured and simulated value from the operative mode and from messages to the operator as indicated below.



The display contrast can be adjusted using the **<ENTER> + <4> or <9>** keys.

The backlight intensity can be adjusted using **<ENTER> + <1> or <6>** keys.

Important notes :

- *Remember that a high backlight intensity reduces the battery operative live*
- *Remember that to obtain the maximum performance in term of accuracy the backlight must be switched off. In fact the backlight device is a source of internal heating that can contribute to the overall error of the instrument. The stated relative accuracy is declared with the backlight device switched off.*

H.4.1 Display backlight

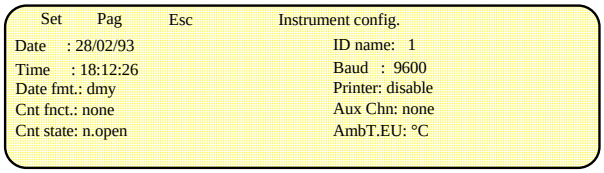
The backlight of the display can be switched "**On** " and "**Off** " using the **<LAMP>** key.

If an operative message is present under the **<LAMP>** key the above operation can be obtained using the **<ENTER> + <LAMP>** key.

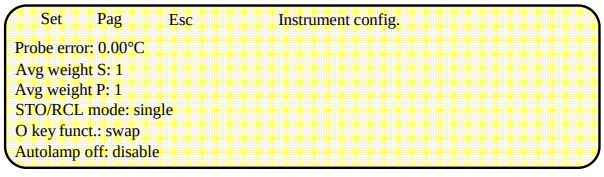
H.4.2 Autolamp mode

To save the energy of the battery and to extend the operative life a programmable routine is used to automatically switch "**Off**" the backlight 5 minutes after the operator's last keyboard instruction.

- To enable (or to disable) the **-Autolamp-** mode press the **<MENU>** key to obtain the **<Instrument Config>** message.
- Press one of the **<Instrument Config>** keys to obtain the following indication.



Press the <**Pag**> key to visualize the next page menu



Press the <🔼> or <🔽> key to reach the - **Autolamp** - message

Press the **<Set>** key to enable the parameter change

Press the <🔼> or <🔽> key to select the required "**enabled**" or "**disabled**" mode

Press **<Enter>** to acknowledge the selection.

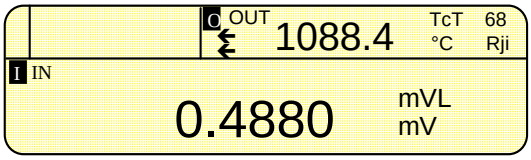
Press the **<Esc>** key to return to the main operative page.

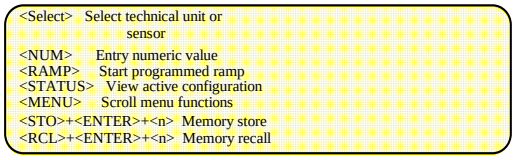
H.5 "Help" key

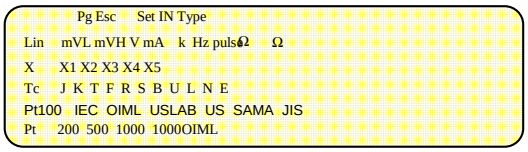
All the operations on the keyboard are simple and easy; any key action displays both a comprehensive instruction or incorrect operation messages.

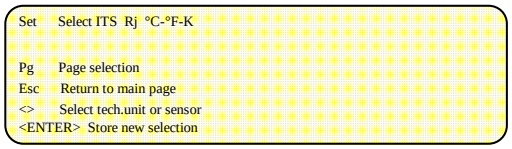
To make the operator's task easier during operating modes, the firmware includes a comprehensive instruction manual with a full set of "Help" pages with an immediate indication of pertinent actions required.

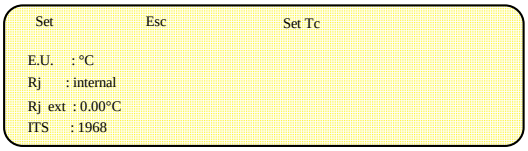
Three typical pages obtained when pressing the **<HELP>** key are:

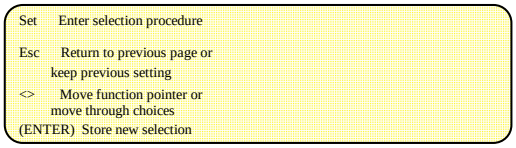





Pg Esc Set IN Type
Lin mVL mVH V mA k Hz puls Ω Ω
X X1 X2 X3 X4 X5
Tc J K T F R S B U L N E
Pt100 IEC OIML USLAB US SAMA JIS
Pt 200 500 1000 1000OIML






Set Enter selection procedure
Esc Return to previous page or keep previous setting
<> Move function pointer or move through choices
(ENTER) Store new selection

H.6 Configuration review (Status)

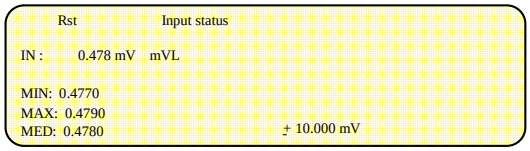
The actual configuration of the instrument can be easily reviewed.

Press the **<STATUS>** key to obtain a sequence of pages with the relevant header.

Upper or Lower slot display (basic and internal status) can be selected using the <IN-OUT> key.

- **Input channel status**

Actual operating mode, value, technical unit, minimum value, maximum value and median value with actual positive and negative deviation are displayed.

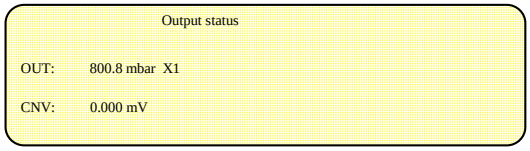


The Minimum and Maximum values can be reset using the <Rst> key.

- **Output channel status**

Actual operating mode, value and technical unit are displayed.

CNV: Convert= electrical signal value equivalent to the technical unit value

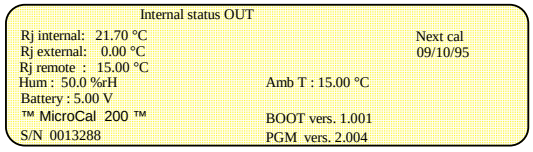


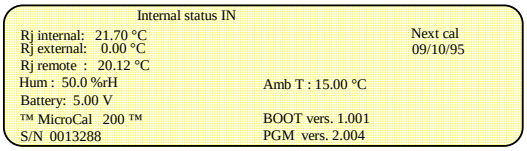
Press the <STATUS> key to enter the pages relevant to the internal status (respectively to INput channel and OUTput channel) as it follows:

- **Internal status**

Information related respectively to:

- Rj internal temperature (inside black terminal);
- Rj external (memory stored value);
- Rj remote (indicates the remote temperature when the appropriate Rtd is connected to the back panel connector. If the Rtd is disconnected, the indication will be "Underrange";
- Battery voltage;
- S/N: Serial number of the instrument;
- Boot program version number;
- Firmware version number
- Next calibration date (only when programmed)
- Humidity and ambient temperature (only when programmed)





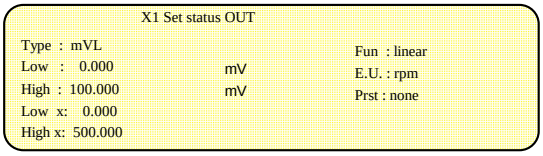
- **X1, X2, X3, X4, X5 Output Set Status**

Five output scale factor configurations can be reviewed.

The parameters considered are:

- Type: signal or sensor
- Low: electrical signal - zero
- High: electrical signal - full scale
- Low x: display scaled zero indication
- High x: display scaled full scale indication
- Fun: linear or square
- E.U.: Symbol of the engineering unit

A typical indication will be the following:



Press any **<▲>** or **<▼>** key to select the next or the previous display of the five pages of "X" output status.

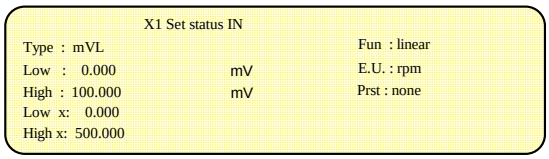
- **X1, X2, X3, X4, X5 Input Set Status**

From the above "X" Output Set Status pages press the **<IN-OUT>** key to select the **IN**put "X" Set Status Pages. Five input scale factor configurations can be reviewed.

The parameters considered are:

- Type: signal or sensor
- Low: electrical signal - zero
- High: electrical signal - full scale
- Low x: display scaled zero indication
- High x: display scaled full scale indication
- Fun: linear or square
- E.U.: Symbol of the engineering unit

A typical indication will be the following:

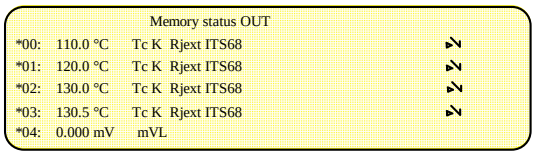


Press any **<▲>** or **<▼>** key to select the next or the previous display of the five pages of "X" input status.

- **Memory status**

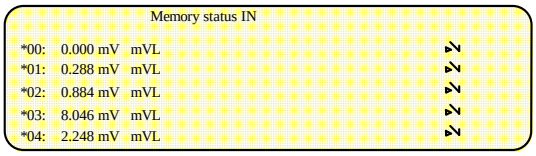
From one of the above pages press the **<STATUS>** key to obtain IN and OUT memory status pages. Four pages with a total of 20 memory stored data items are available both for INput and OUTput data items.

The following is a typical displayed page:


Memory status OUT
*00: 110.0 °C Tc K Rjext ITS68
*01: 120.0 °C Tc K Rjext ITS68
*02: 130.0 °C Tc K Rjext ITS68
*03: 130.5 °C Tc K Rjext ITS68
*04: 0.000 mV mVL

Press any **<▲>** or **<▼>** key to recall the previous o the next of the **OUT**put Memory Status pages (rolling 0-4, 5-9, 10-14, 15-19).

Press the **<IN-OUT>** key to recall the **IN**put Memory Status pages.



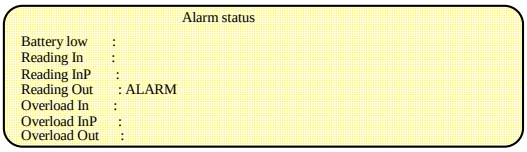
Press any **<▲>** or **<▼>** key to recall the previous o the following of the INput Memory Status pages (rolling 0-4, 5-9, 10-14, 15-19).

Press the **<IN-OUT>** key if you require to recall OUTput Memory Status pages.

- **Alarm status**

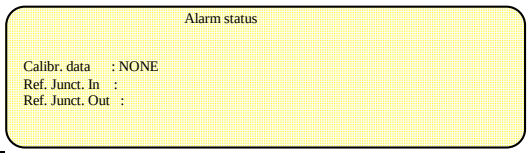
This page allows to review alarm warning conditions announced during operation with an acoustic signal :

- An - ALARM - message will be displayed where applicable.
- The - Ref. junction IN/OUT - is related to the internal automatic Rj compensation.
- The - Overload IN/OUT/InP - is related to anomalous operative condition of the auxiliary power supply (eg. current simulation into an active loop).
- The - Calibration Date - gives a warning when the next calibration date has expired.
- The -Reading In/InP/Out- is related to the alarm function setting (see par. 8.10 for description and setting)

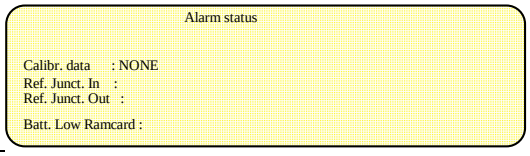


Press any **<⓿>** or **<❶>** key to recall the previous o the following Alarm Status pages.

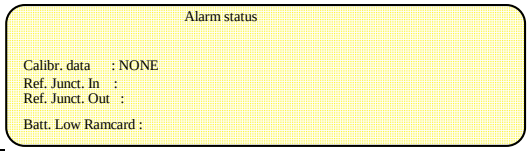
Calys 1000



Calys 1200



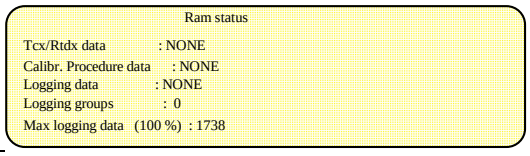
Calys 1500



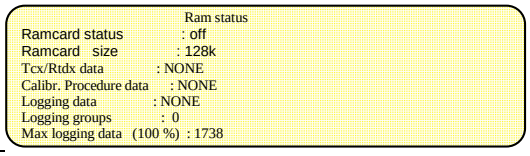
- **Ram status**

Two different pages are available according to the type of instrument

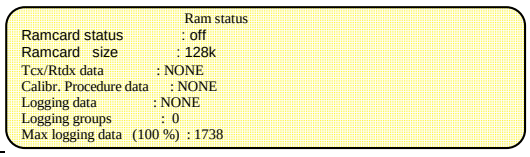
Calys 1000



Calys 1200


Ram status
Ramcard status : off
Ramcard size : 128k
Tcx/Rtdx data : NONE
Calibr. Procedure data : NONE
Logging data : NONE
Logging groups : 0
Max logging data (100 %) : 1738

Calys 1500


Ram status
Ramcard status : off
Ramcard size : 128k
Tcx/Rtdx data : NONE
Calibr. Procedure data : NONE
Logging data : NONE
Logging groups : 0
Max logging data (100 %) : 1738

The above data are self-explanatory and summarize the operative data/mode present into the instruments

H.7 General configuration set-up

This procedure allows the set-up of the general configuration of the instrument relevant to the parameter indicated below:

Date (sets clock date -adjusts month/day/year according to the date format enabled)

Time (sets clock time -adjusts hours/minutes/seconds)

Date fmt (selects the date format "dmy" or "mdy")

Cnct fnct (selects the external contact mode: none, hold, ons OUT, ons IN) ons=one-shot start/stop

Cnct state (selects the external contact configuration: n.open (normally open) or n.closed (normally closed))

ID name (sets the digital interface machine identification code from 1 to 99)

Baud (selects the baud rate among the following: Off - 300 - 600 - 1200 - 2400 - 4800 - 9600 - 19200 - 38400 - 57600 - 115200)

Printer (selects "enable" or "disable")

Aux Chn (select the external sensor connected to the auxiliary connector among the following: none, humidity)

AmbT EU (Set the engeneering unit for ambient temperature measured with the humidity/temperature external sensor)

Probe err (sets the temperature remote sensor deviation from the actual one for higher accurate temperature measurements)

Avg weight S (sets the Average weight value from 1 to 255 for electrical inputs)

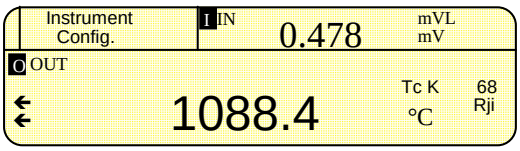
Avg weight P (sets the Average weight value from 1 to 255 for pressure inputs)

STO/RCL mode (selects store and recalls operations simultaneously for single and multiple channels)

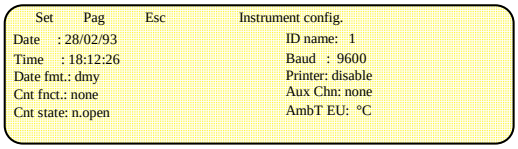
AutoLmp (selects display backlight automatic switch-off after 5 minutes)

key function (configure the key to operate in swap (between the 2 slot display) or scroll (between the channels) mode)

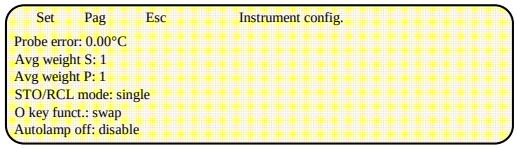
– Press the **<MENU>** key to obtain the following indication:



– Press one of the **<Instrument Config >** keys to obtain the following indication.



– Press, if necessary, the **<Pag>** key to visualize the next page menù

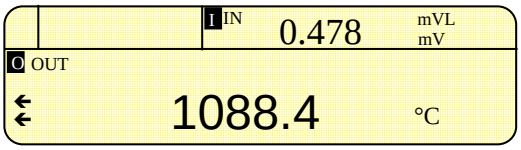


– Press the **<◍>** or **<●>** key to select the parameter to be modified;
– Press the **<Set>** key to enter the adjustment step;
– Press the **<◍>** or **<●>** key to adjust or modify the selected parameter;
– Press the **<ENTER>** key to acknowledge and memory store new data;
– Press the **<Esc>** key to return to the previous page and in the operative mode with the new configuration.

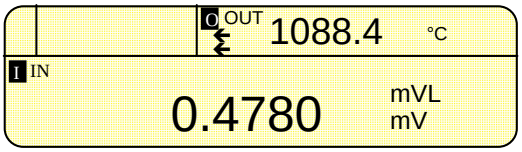
The new configuration will be held into the memory until the next change.

H.8 Slot display swapping

If the <> key is sett for the swapping mode (see par. 8.6), the operator can swap the indication displayed in the upper slot with the lower slot one using the <> key; eg. from the display page indicated below:



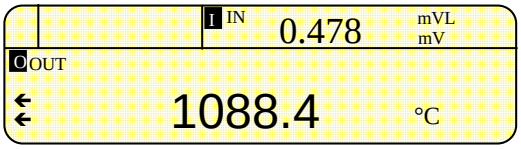
Press the <> key to obtain the following indication:



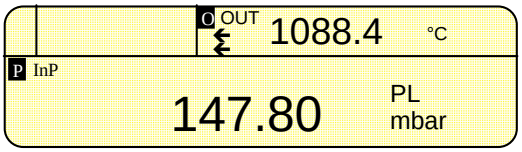
If the <> key is setting for scrolling mode (see par. 8.6), the operator can swap the indication displayed in the upper with the indication in the lower slot by pressing the **<Shift>** + <> keys.

H.9 Channels scrolling

If the <> key is set for the scrolling mode (see par. 8.6), the operator can visualiza on the display the non displayed channel using the <> key; eg. from the display page indicated below:



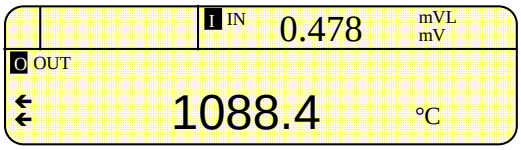
Press the <> key to obtain the following indication:

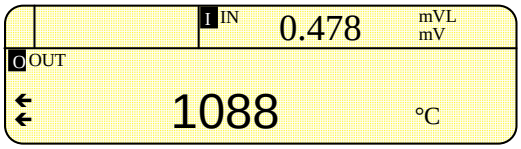


If the <> key is setting for the swapping mode (see par. 8.6), the operator can scroll between the channels by pressing the <Shift> + <> keys.
NOTE: if the pressure module PM200 is not connected, a 'no module' message will be displayed.

H.10 Decimal point position

<🡐 > and **<🡒 >** keys allow the adjustment of the decimal point position for all Tc, Rtd and Hz ranges.





<🡐 > and **<🡒 >** keys also allow the measuring range change for mV, □ parameters (channel IN and OUT).

H.11 Average mode

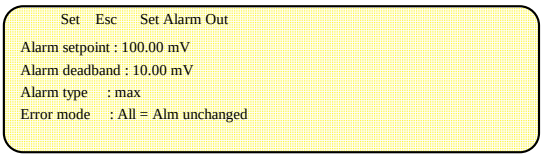
The instrument is equipped with a special algorithm to allow measurements of an unstable input signal.
The weight of the average is programmable from 1 to 255 through the general configuration set-up procedure described in par. 8.7.
The appropriate setting should be based on a practical test taking into consideration that to an high programmed weight corresponds a high average effect.

H.12 Autorange

This function performs the autoranging for voltage, resistance and frequency measurements.
When the function is applicable press the **<Menu>** key to obtain 'Autorng on' menù message.
Press **<Autorng>** to toggle between -On- and **-Off-** state to activate/disable the function.
The message "ARN" will appear on the active slot if the function is abilitate.

H.13 Alarm function

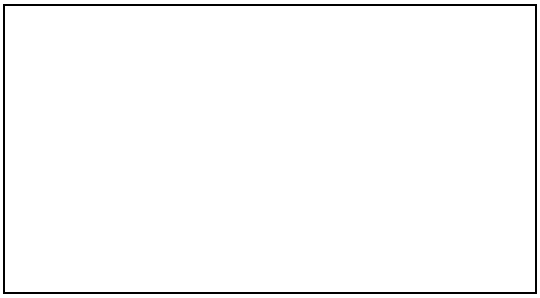
Press the **<Menu>** key to obtain *'Set alm'* menù message.
Press the **<Set Alm>** key to obtain the following indication :

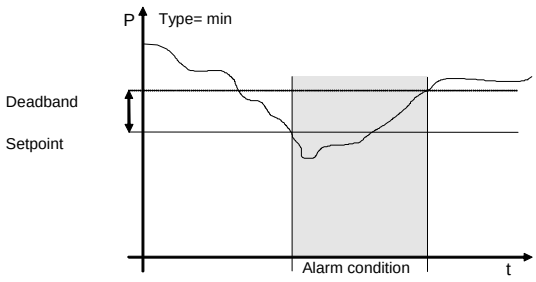


Alarm set point	to set the alarm value
Alarm deadband	to set the deadband value
Alarm type	the type of the alarm (max or min)
Error mode	**All** = the errors don't change the alarm state
	Udr off = the Underrange error switches off the alarm ; the other errors switch it on
	Udr on = the Underrange error switches on the alarm ; the other errors switch it off
	All off = an error switches off the alarm state
	All on = an error switches on the alarm state

- Press the **<🡑>** or **<🡓>** keys to select the required parameter to be adjusted;
- Press the **<SET>** key to enable the selected parameter adjustment;
- Press the **<🡑>** or **<🡓>** keys to select the required application configuration;
- Press the **<ENTER>** key to memory store the new selection;
- Press **<Enter>** to return to the menu.
- Press the **<Alm Enbl>** or **<Alm Dsbl>** to enable / disable the alarm function.

NOTE: On the measure slot display, an 'AL' message will appear when an alarm condition happen.

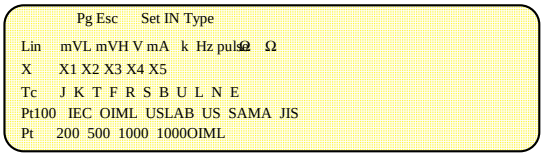




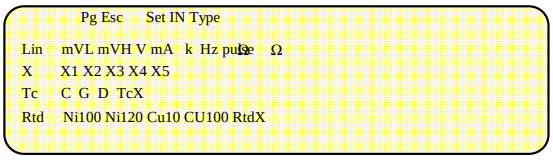
H.14 Parameter or sensor selection

To select the electrical parameter or the sensor required by the application, in any measuring or simulation mode, follow the procedure indicated below:

- Switch the instrument -ON-;
- Select the required -IN- or -OUT- mode using the **<IN-OUT>** key (pointer on the relevant mode)
- Press the **<SELECT>** key to obtain eg. the following menu page indicating all electrical ranges and thermoelectric sensors available for the measurement channel:


Pg Esc Set IN Type
Lin mVL mVH V mA k Hz puls Ω Ω
X X1 X2 X3 X4 X5
Tc J K T F R S B U L N E
Pt100 IEC OIML USLAB US SAMA JIS
Pt 200 500 1000 1000OIML

- A second menu page can be obtained using the <Pg> key.



Press **<▲> <▼>** or **<◄ > <► >** cursor keys to select the required signal or sensor;

Press the **<ENTER>** key to memory load the selection; the instrument will return to the previous operative mode with the new selected electrical signal or sensor;

By pressing the **<ESC>** key, instead of **<ENTER>**, the instrument will not acknowledge any variation and will return to the previous parameter or sensor.

Check a correct sensor selection using the following table:

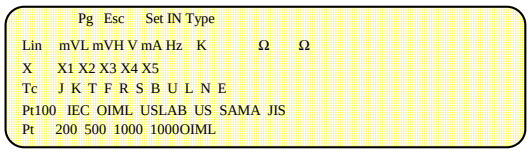
IEC	α =	0.00385
OIML	α =	0.003910
USLAB	α =	0.003926
US	α =	0.003902
SAMA	α =	0.003923
JIS	α =	0.003916
Pt200, Pt500, Pt1000	α =	0.00385
Pt1000 OIML	α =	0.003910

H.15 Scale factor mode set-up

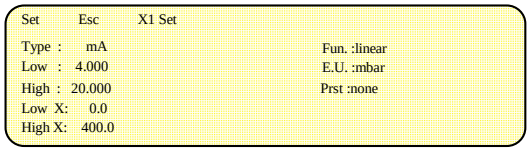
The "scale factor" mode is a method to read or to simulate electrical signal values in terms of engineering units eg. the below indicated procedure shows the use of the "scale factor" function for the calibration of a potentiometric recorder with a scale from 0.0 mbar to 400.0 mbar corresponding to an electrical linear input signal from 4 to 20 mA.

Five factors scale set-up are available both for INput and OUTput channels.

- Switch the instrument **<ON>**
- Select the required -IN- or -OUT- channel using the **<IN-OUT>** key
- Press the **<SELECT>** key to obtain the menu selection page


Pg Esc Set IN Type
Lin mVL mVH V mA Hz K Ω Ω
X X1 X2 X3 X4 X5
Tc J K T F R S B U L N E
Pt100 IEC OIML USLAB US SAMA JIS
Pt 200 500 1000 1000OIML

- Press the <♦> <♦> or <◄><►> cursor keys to select X1, X2, ...X5 program
- Press the <Set> key to enter the configuration page of the X1, X2, ...Xn program



Each parameter can be adjusted upon the application requirement.

- Press the **<●>** key to select the "Type" of parameter/range
- Press the **<Set>** key to abilitate the parameter/range selection
- Press the **<●>** or **<●>** key to select the required parameter/range among:
  mVL • mVH • V • mA • Hz • Ω • k□Ω • 0-100 mV • 0-10 V • 1-5 V • 0-20 mA • 4-20 mA • 0-500 Ω • 0-5 kΩ
- Press the <ENTER> key to acknowledge the new setting and to memory store the new selection
- Press **<●>** and **<●>** keys to select the other required parameters using the same procedure indicated above

  Low set the low end of the electrical signal

  High set the full scale value of the electrical signal

  Low X set the low end value of the engineering scaled unit

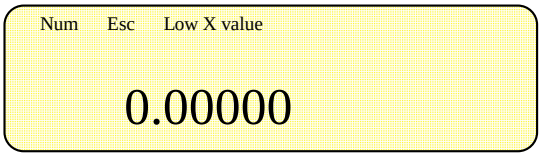
  High X set the full scale value of the engineering scaled unit

  Fun. select the linear or square mode

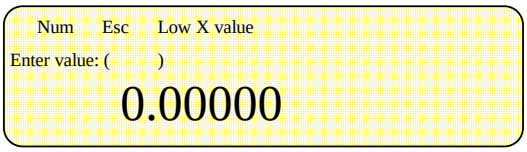
  E.U. select the scaled engineering unit

  Prst select the preset for the scaling function (none, 0-100mV, 0-10V, 1-5V, 0-20mA, 4-20mA, 0-500Ω, 0-5kΩ)

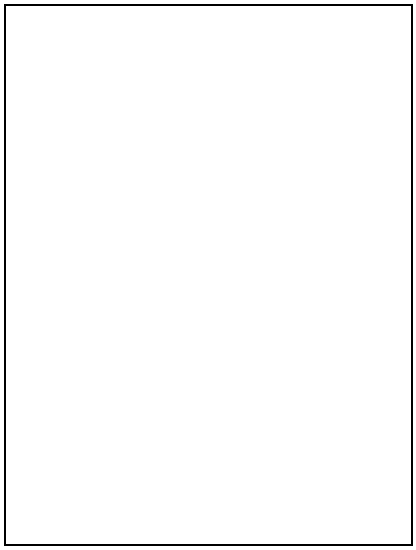
- A typical numeric adjustment of a page is the following one:



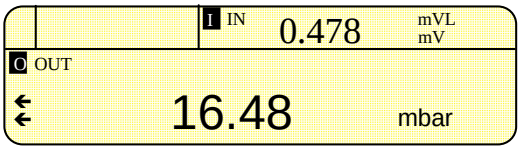
- Set the required value using the in-line single-digit mode or the direct numeric entry mode pressing the <Num> key to obtain the following indication:



- In this case the required number and decimal point position must be entered using the numeric keyboard
- Press the **<ENTER>** key to acknowledge and to memory store the new setting
- Press **<Esc>** to return to the previous page or to reject the new set-up.
- The Engineering Unit (E.U.) can be set using a continuous scrolling, with the last four keys, of all characters indicated in the following table :



To obtain for example the following indication:

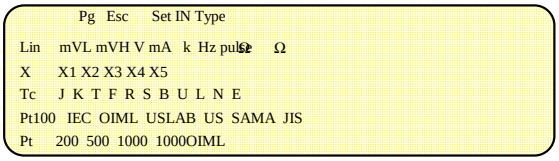


- After each adjustment press the <ENTER> key to memory store new data

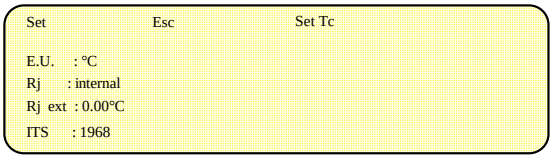
H.16 Temperature parameters selection

This procedure is automatically enabled only when the relevant channel is programmed for thermocouple measurement or simulation.

- Press the <SELECT> key to enter the procedure obtaining the signal or sensor menu page e.g. as it follows:


Pg Esc Set IN Type
Lin mVL mVH V mA k Hz pulse Ω
X X1 X2 X3 X4 X5
Tc J K T F R S B U L N E
Pt100 IEC OIML USLAB US SAMA JIS
Pt 200 500 1000 1000OIML

- Select the required thermocouple moving the cursor using the **<▲>** or **<▼>** or **<🡄 ><🡆 >** keys.
- Press the **<SET>** key to obtain,for example, the following indication:



E.U. (engineering unit) = °C , °F or K

Rj (reference or cold junction) = **Internal** (automatic compensation at input terminals with a calibrated thin film Pt100)

external (adjustable from -50°C to +100°C)

remote (remote automatic compensation: requires the connection of an external Pt100)

Rj est. = adjustable from -50 to +100 °C

ITS (Internat. Temperature. Scale) = ITS1968 or ITS1990

Internal Rj mode use, as cold junction reference for temperature compensation, a resistance thermometer built-in the terminals. A special AOIP sas design allows a fast and accurate response.

External Rj mode allows to manually adjust the reference when it is not possible to compensate using the internal Rj or for Rj fault.

The remote Rj (reference or cold junction) compensation can be used either for accurate temperature readings using an external Pt 100 or to obtain a remote automatic Rj compensation when a number of thermocouples Rj are kept at constant temperature inside a temperature controlled cabinet.

A special feature is available in the instrument to correct the error of the external Pt 100 sensor and to obtain actual true accurate readings or Rj compensations.

When an external sensor is connected to the instrument the actual reading will be influenced by the accuracy of the instrument itself and by the inaccuracy of the sensor used.

Through the "Instrument Config" routine the operator can select and memory load the relevant "Probe err" specific to the resistance thermometer used.

"Probe err " is meant as the actual deviation entity (error) of the remote Pt 100 resistance thermometer at the required Rj temperature.

The deviation error value (in °C) can be obtained from the report of calibration of the remote RTD or through an in-situ comparison with a working standard element.

- Press the **<▲>** or **<▼>** keys to select the required parameter to be adjusted;
- Press the **<SET>** key to enable the selected parameter adjustment;
- Press the **<▲>** and **<▼>** keys to select the required application configuration;
- Press the **<ENTER>** key to memory store the new selection;
- Press the **<ESC>** key twice to return to the operative mode.

H.17 Rj fast mode selection

During normal -IN- or -OUT- operation with thermocouples the operator can directly change the Rj mode as it follows:

Press the **<MENU>** key and the required Rj mode:

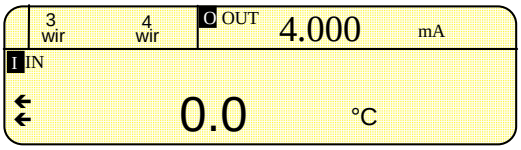
Rj int.(ernal)
Rj ext.(ernal)
Rj rem.(ote)
using the appropriate key.

This new Rj mode will be operative until a new change occurs and it will be also stored when the instrument is switched -Off-.

H.18 Resistance thermometer selection

When the measurement operative mode for resistance or resistance thermometer has been selected

- Press the **<MENU>** key to obtain the following indication:



- Press the **<3 wire>** or the **<4 wire>** as required by the running application.
  The selected configuration will be memory stored until a new instruction is memory loaded.

H.19 IN-OUT data memory

The availability of a 20-step memory, both for INput and OUTput channels, represents an important feature either in simulation or in measurement modes.

In the measurement mode it can be useful to store twenty input values pertinent to special test conditions.

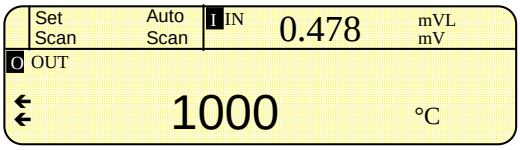
In the simulation mode, the permanent availability of twenty calibration values can be useful , eg. during the calibration of the scale of a recorder.
To memory load each memory cell select first the appropriate operative mode and set the required value;

- Press **<STO>, <0> .....<9>** to memory store data in the required memory position from 0 to 9;
- Press **<STO>, <ENTER>, <0> .....<9>** to memory store data in the required memory position from 10 to 19;
- Press **<RCL>, <0> .....<9>** to recall the memory stored value from 0 to 9;
- Press **<RCL>, <ENTER>, <0> .....<9>** to recall the memory stored value from 10 to 19.

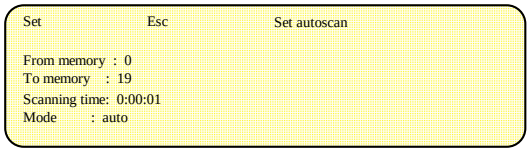
Memory stored data can be reviewed pressing the <STATUS> key to obtain the four pages headed - Memory Status -.

H.20 Autoscan program mode

The Autoscan program mode is based on twenty memory stored values that can be addressed, in sequence, to the output terminals.
With the instrument in a normal operative mode, press the **<MENU>** key to obtain the following indication:



Press the <SET> key to define the Autoscan program obtaining the following indication:

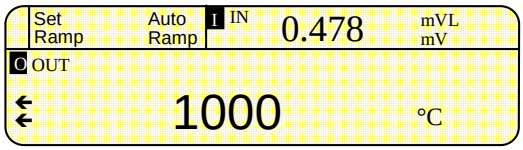


Press **<▲>** and **<▼>** keys to select the parameter to be changed;
Press the **<SET>** key to enable the single parameter adjustment;
Press **<▲>** and **<▼>** keys to adjust the value or mode required;
Press the **<ENTER>** key to memory store the new data;
Press the **<ESC>** key to return to the normal operative mode;
Press the **<Autoscan>** key to run the program;
Press any key to stop the program when in - Auto mode -.

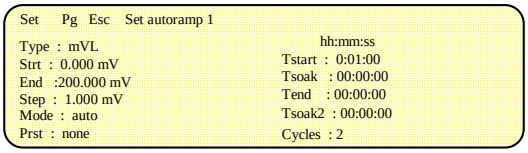
H.21 Ramp program mode

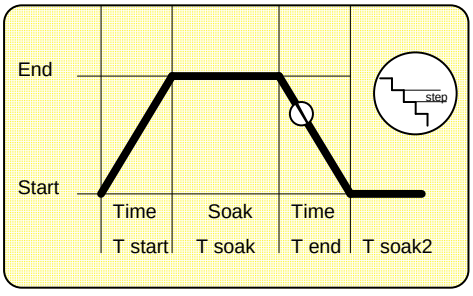
The instrument, through an easy to follow menu-driven set up, can be programmed to simulate a continuous or step output cycle.
By programming the incremental steps to their minimum value the step ramp can be assimilated to a continuous ramp.
First select the technical unit (°C, °F or K), the type of sensor/parameter and then follow the procedure indicated below.

- Press the <MENU> key to obtain the following indication:



- Press the **<Set Ramp>** key
- Press the **<Pg ●>** key to select Autoramp 1 or Autoramp 2;
- Press the **<▲>** or **<▼>** key to select the parameter to be modified or adjusted;
- Press the **<SET>** key to enable the selected parameter adjustment;
- Press the **<▲>** or **<▼>** key to modify or adjust the parameter;
- Press the **<ENTER>** key to memory store each parameter (if modified).





Pyst

For fast set up of the simulation cycle (S) the operator can select one of the following programs:

- none (must be selected when Start,End ,Step are not programmed and therefore the operator has selected and memory loaded free required values)
- 0 - 5 kΩ
- 0 - 500 Ω
- 4 - 20 mA
- 0 - 20 mA
- 1 - 5 V
- 0 - 10 V
- 0 - 100 mV

If one of the above is selected automatically each relevant datum will be shown in correspondence with Type,Start,End,Step parameters. The step value can be eventually reprogrammed if required.

Please note the following terminology classification:

Mode

Defines the autoramp mode of operation and can be programmed as it follows:

Manual

The output value will follow the overall programmed cycle with the step by step operator's instructions. Each time the <Autoramp > key is pressed the autoramp will move up (or down) one step value.

Auto

The instrument will generate the programmed number of cycles (eg n°2 cycles)

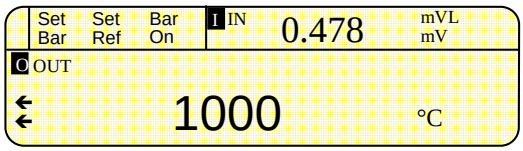
At the end of the last cycle the instrument will stop simulation.

Continuous

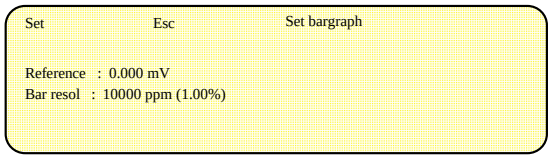
The instrument will run a non limited number of cycles until the operator's "Stop" by using the <Autoramp> key.

H.22 Bargraph function

- Press the "**Menu**" key until you see the following menu:



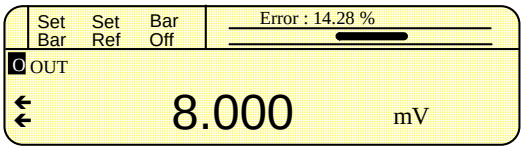
- Position the arrows by the **<IN-OUT>** key to select the desired channel (IN/OUT) you want to program the bargraph values.
- Press the **<NUM>** (SET BAR) key to obtain the following.



- Press the **<NUM>** (SET) key to set the reference value for the bargraph
- Press the <♦>key to select the following line and press **<NUM>** (SET) to set the desidered bargraph resolution of every pixel.
- Press **<ENTER>** twice.

In order to set immediately a new reference value with the value actually displayed for the channel selected press the **<LAMP>** (SET REF)key.

To display the bargraph press the **<RAMP>** (BAR-ON) key, the display will show:



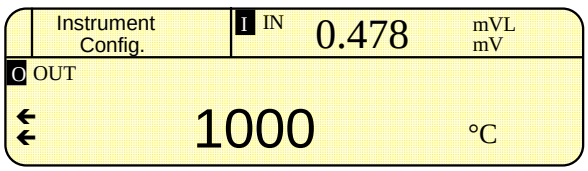
(with a reference of 7.000mV)

When you modify the output value the bargraph will show the new deviation value (error) in graphical format

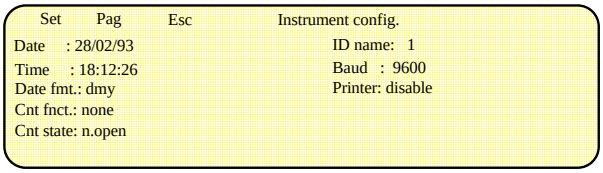
H.23 Switch test routine

This function is useful to test two kinds of thermostat units, one with a built-in sensor and the other with an external sensor.When you activate this function the instrument will record the values in which the thermostat contact will change its state (i.e. when the contact closes and when the contact reopens).

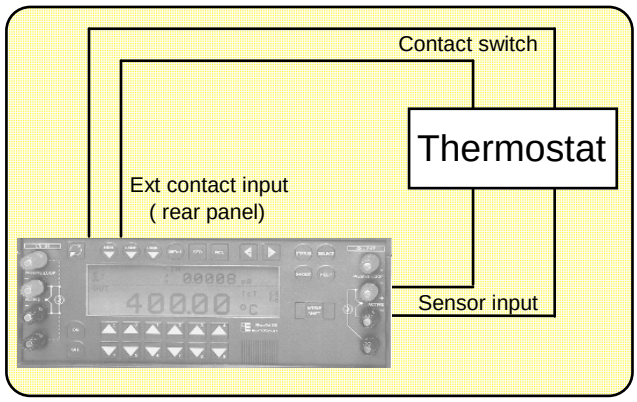
To enable this function press the <MENU> key until you reach the following menu:



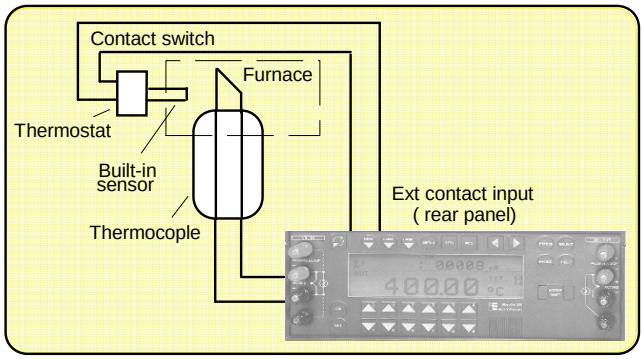
- Press one of the **< Instrument Config >** keys to obtain the following indication.



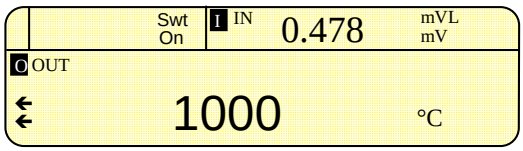
- Move the cursor with the <♦> key to select the "Cnt fnct." line, press **<NUM>** (Set) and with <♦> or <♦> keys select: "swtc OUT" or "swtc IN"; The choice depends on the thermostat type you want to test: "swtc OUT" is for thermostats with external sensor. The OUTPUT channel of the **Calys 1000/1200** and **Calys 1500** should be connected to the input terminal of the thermostat and the switch of the thermostat must be connected to a 25-pin connector located on the rear panel of the instrument.



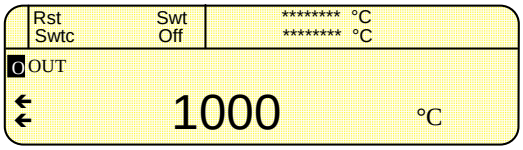
"switch IN" is for a thermostat with a built-in sensor and the INPUT channel of the **Calys 1000/1200** and **Calys 1500** must be connected to a sensor that will read the same temperature of the thermostat and the switch of the thermostat must be connected to a 25-pin connector located on the rear panel of the instrument.



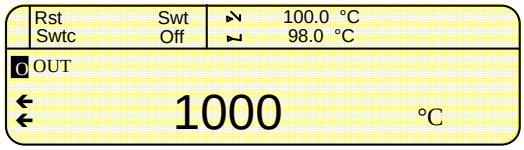
- Press the **<ENTER>** key.
- Move the cursor with the <♦> key to select the "Cnt state" line, press **<NUM>** (Set) and with <♦> or <♦> keys select: "n. open" or "n. close" depending on the normal state of the thermostat switch.
- Press the **<ENTER>** key twice.
- Press the **<IN-OUT>** key to select the channel that must be used depending on the choice previously made (switch OUT or switch IN)
- Press the **<MENU>** key until you reach the following menu:



- Press the **<RAMP>** (Switch On) key to enable the switch test routine and initially the display will show:



When the condition of a change in the state of the thermostat switch is reached, the instrument will record the value in which the transition occured. Moreover, when the thermostat switch returns to the original position the instrument will record the other value in which this new transition occurred.

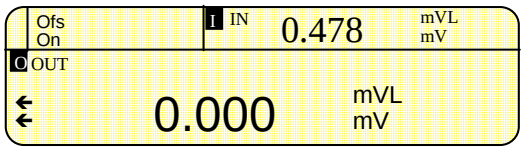


In order to reset the recorded values for a new check press the **<NUM>** (Rst Swtc) key.

H.24 Offset mode set-up

This mode allows the setting of the offset value in measurement and simulation to cancel the influence of an unrequired portion of the signal.

- Select the required operative mode;
- Press the **<MENU>** key to obtain the following indication:



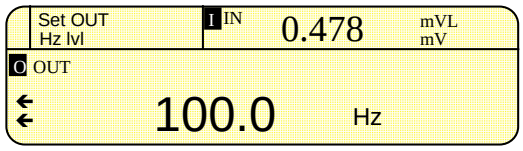
- For the simulation mode check the indication of the instrument under calibration.
- Adjust the calibrator output to match the required indication of the instrument under test.
- Press the **<Ofs On>** key to abilitate the offset mode set-up or the **<Ofs Off>** to disable the offset mode;

H.25 Frequency I/O

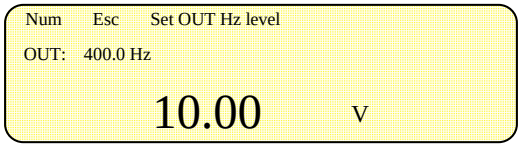
The instrument is equipped with an operative mode to allow frequency measurement and simulation.
The measurement mode requires an appropriate threshold set-up from 0 to 20 V and the simulation mode an output voltage level adjustment (0 to 20 V).

H.25.1 Frequency OUT

- Select the -Frequency Out- operative mode;
- Press the **<MENU>** key to obtain the following indication:



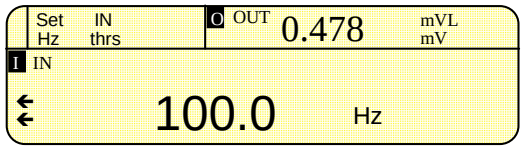
- Press the <Set OUT Hz lvl> key to enable the output pulse voltage level setting, obtaining the following indication:



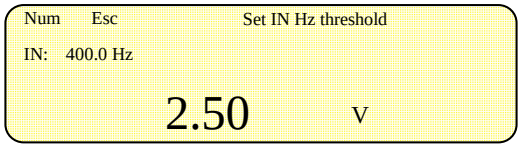
- Adjust the required output pulse voltage level value (range 0-20 V) with **<⓿>** and **<●>** keys or with the direct numeric entry through the **<Num>** key.
- Press the **<ENTER>** key to acknowledge the required value.
- The output pulse frequency can be programmed using **<⓿>** and **<●>** keys or the direct numeric entry mode with the **<Num>** key.
- The decimal point position can be set at 0.1 , 0.01 or 0.001 Hz using **<🡐 >** and **<🡒 >** keys.

H.25.2 Frequency IN

- Select the -Frequency In- operative mode;
- Press the **<MENU>** key to obtain the following indication:



- Press the **<Set IN Hz Thrs>** to program the required threshold voltage level obtaining the following indication:

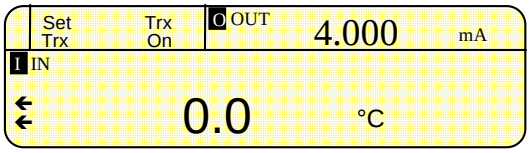


- Adjust the required threshold value (range 0-20 V) with **<⓿>** and **<●>** keys or with the direct numeric entry mode with the **<Num>** key.
- Press the **<ENTER>** key to acknoledge the required value.
- The measurement resolution can be set at 0.1 , 0.01 or 0.001 Hz using **<🡐 >** and **<🡒 >** keys.

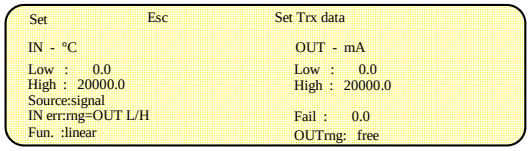
H.26 Transmitter simulation

The instrument can be configured as a true universal programmable signal converter with IN/OUT insulation.
This operative mode can be used eg. as a temporary replacement of a transmitter.

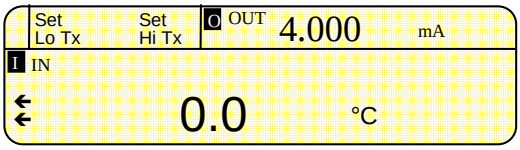
- To enter this operative mode press the **<MENU>** key to obtain the following indication:



– Press the **<Set Trx>** key to enable the relevant settings as indicated below:



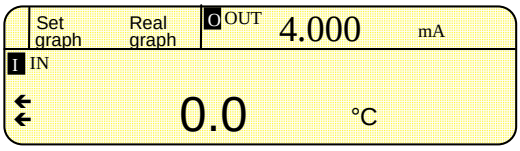
– Press **<🔘>** and **<●>** keys to select the required parameter.
– Press the **<Set>** key to allow value adjustment (OUTrange can be selected as free or limited to be programmed).
– Press the **<ENTER>** key to acknowledge the required value.
– Repeat the procedure to set other parameters.
– Press **<Enter>** to return to the signal converter menù.
– Press the **<Trx On>** key to abilitate the programmable signal converter operative mode.
– At the end of the application remember to switch the above operative mode off pressing the **<Trx off>** key.
– When the programmable signal converter operative mode is abilitated two additional key messages will appear on the left-top side of the display when the **<MENU>** key is pressed as it follows:



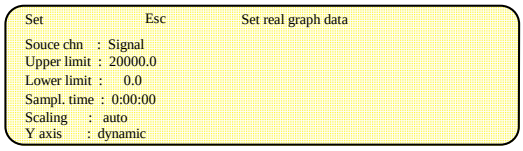
– Press the **<Set LoTx>** or **<Set HiTx>** key to memory load both Low and High limit settings relevant to the actual measured and displayed value.

H.27 Graphic operative mode

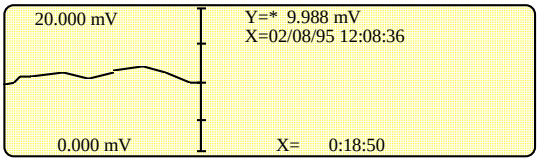
This operative mode is available only when the instrument is equipped with data memory and real time clock (options A = 1 and 2).
– To enter this operative mode press the <MENU> key to obtain the following indication:



– Press the <Set graph> key to enable the relevant settings as it is indicated below:



– Press **<🔘>** and **<●>** keys to select the required parameter.
– Press the **<Set>** key to allow value adjustments (Res. time is the time interval between two readings and Y axis can be setted as dynamic or fixed)).
– Press the **<ENTER>** key to acknowledge new values.
– Press the **<Real graph>** key to obtain the direct graphic profile of the input parameter against the actual time.



The upper time counter indicates the progressive time of acquisition.
The lower time indicates the total time of the acquisition.
– Press the following keys for further instructions or to exit from the graph mode:

<🔘>	Return to the previous page
<STATUS>	Toggle numbers (enable graph only - press once more to cancel)
<RCL>	Toggle grid (press once more to cancel)
<STO>	Freeze graph (press once more to cancel)
<ENTER>+><←>or<→>	Move Y axis FAST or NORMAL to review and read the actual value for a required actual time

The above instructions can be obtained pressing the **<Help>** key while in the graph mode.

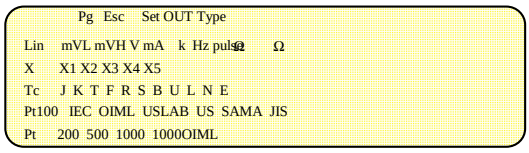
H.28 Pulse I/O

The instrument is equipped with an operative mode to allow pulse measurement and simulation.

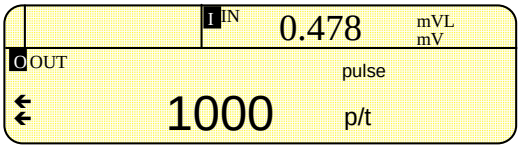
The measurement mode requires an appropriate threshold set-up from 0 to 20 V and the simulation mode the set-up of the required output voltage level (from 0 to 20 V).

H.28.1 Pulse OUT

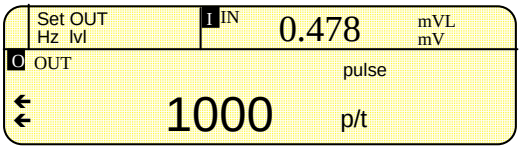
- Press the **<SELECT>** key to obtain the following indication:


Pg Esc Set OUT Type
Lin mVL mVH V mA k Hz pulse Ω Ω
X X1 X2 X3 X4 X5
Tc J K T F R S B U L N E
Pt100 IEC OIML USLAB US SAMA JIS
Pt 200 500 1000 1000OIML

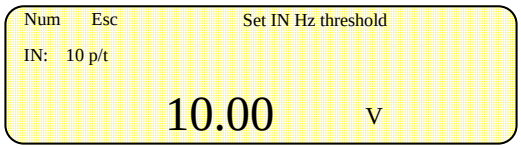
- Select the -pulse- operative mode and press the **<ENTER>** key to acknowledge the selection obtaining eg. the following indication:



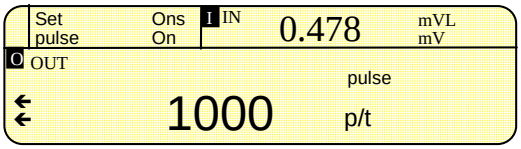
- Press the **<MENU>** key to obtain the following indication:



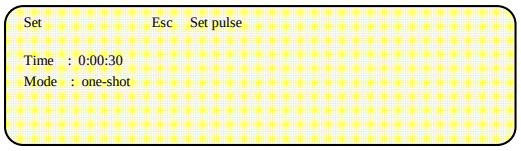
- Press **<Set OUT Hz lvl>** to enable the output pulse voltage level setting, obtaining the following indication:



- Press the **<ENTER>** key to acknowledge the new setting.
- Press the **<MENU>** key to obtain the following indication:

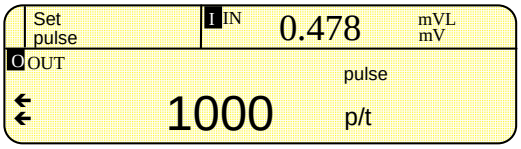


- Press the **<Set pulse>** key to obtain the following indication:



The "Time base" allows the setting of the pulse time base in hours, minutes and seconds. The mode can be selected as "continuous" or "one-shot".

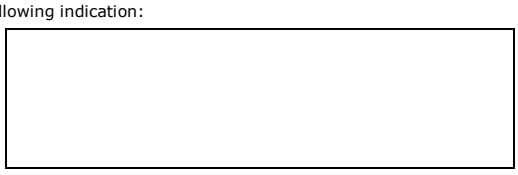
- Press the **<ENTER>** key to acknowledge the new selection. The indication on the top-left of the display "Ons On or Off" will appear only if the one-shot operation has been selected. The instrument will return to the base indication as it follows:



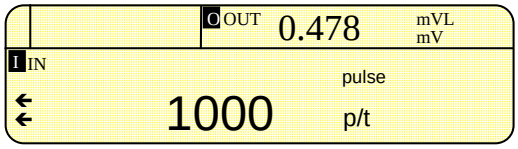
- The required pulse frequency can be set directly with **<●>** and **<●>** keys.
- If the "One-shot" was selected, to start the pulse train press the **<Ons On>** key. Remember that the technical unit can be p/s, p/m or p/h if respectively only seconds, minutes or hours are selected on the "Time base" . If you select a number different from a sigle unit (1s, 1m, 1h) the indication will be p/t (pulse/time). The limits of the "Time base setting are 0:00:01 and 1:00:00 (from 1 second up to 1 hour)

H.28.2 Pulse frequency measurement and counter mode

- Press the **<SELECT>** key to obtain the following indication:

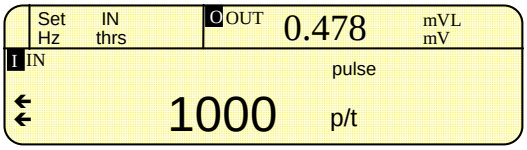


– Select the -pulse- operative mode and press the **<ENTER>** key to acknowledge the required operative mode obtaining eg. the following indication:

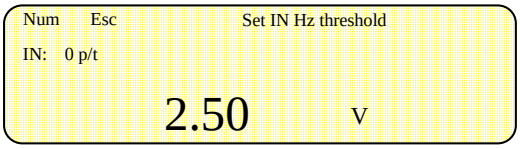


– Remember that the technical unit will be p/t (pulse/time) unless a single unit (1s, 1m, 1h) of the "Time base" is selected (indication P/s, p/m, P/h)

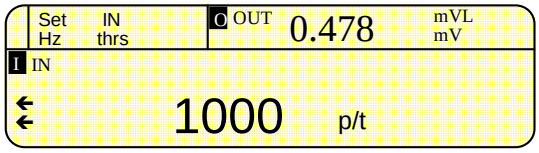
– To set the voltage level threshold press the **<MENU>** key and you will obtain the following indication:



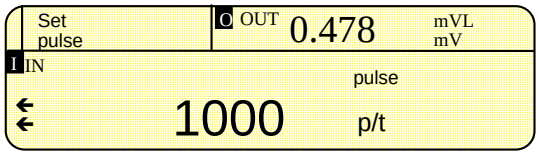
– Press the **<Set IN Hz thrs>** key to enter the set-up page of the threshold voltage level:



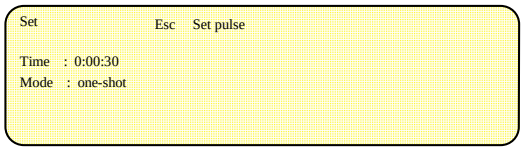
– Press the **<ENTER>** key to acknowledge the new setting and to return to the previous main page:



– Press the **<MENU>** page to reach the following page that enables the pulse setting:

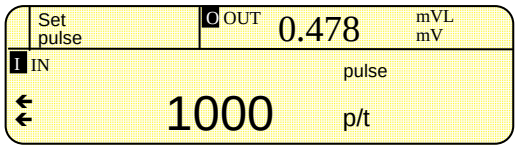


– Press the **<Set pulse>** key to obtain the following indication:



The "Time base" allows the setting of the pulse time base in hours, minutes and seconds. The limits are 0:00:00 and 1:00:00. The mode can be selected as "continuous" or "one shot". "One-shot" together with a "Time base" setting of 0:00:00 allows to work in a counter mode.

– Press the <ENTER> key to acknowledge the selection. The indication on the top-left of the display "Ons On or Off" will appear only when the one-shot operation has been selected. The instrument will return to the base indication:



– In the counter mode (i.e. time base setting = 0:00:00) the <ON> key must be pressed to enable counting and to disable counting, re-press the same key.

H.29 Percentage and error display

The operator could require more convenient operations using percentage values for input and output instrument signals.

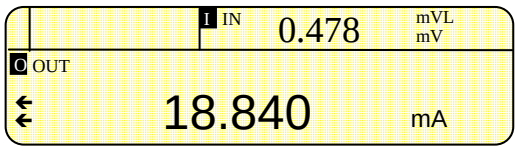
The above is specially required during calibration of eg. A temperature transmitter where the percentage error mode is useful.

The use of percent displays assumes, however, that the operator sets the range limits according to the input and output ranges of the instrument under test.

Calys 1000/1200 and **Calys 1500** is available with an auxiliary operative mode where the measured and simulated values can be shown in percentage of a programmable range with numerical form and bar graph indication.

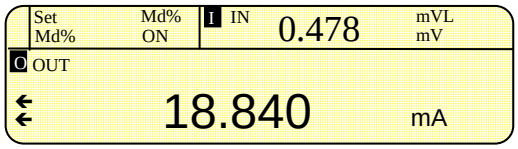
To enter the percent mode procedure follows the procedure indicated below.

– Press the **<ON>** key to switch the instrument -On- and to obtain the main operative page eg. as it follows:

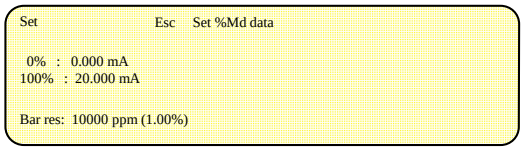


– Move the twin arrows to the channel that require to be abilitated for the percentage mode (in the above displayed page the twin arrows are placed in the "Out" channel.

- Press several times the **<MENU>** key to obtain the following indication:



- Press the **<Set Md%>** key to obtain the following page that allows the setting of percentage scaling as it follows (the example is relevant with the output channel).



Bar graph resolution and percentage relation with zero and full scale of the range are the information that has to be loaded.

- Press **<↑>** and **<↓>** key to select the parameter to be programmed (or modified).
- Press the **<SET>** key to allow value adjustment.
- Press the **<Enter>** key to acknowledge the new data.

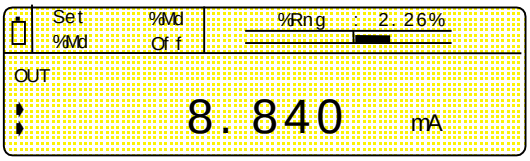
The instrument will return to the main page display. The same procedure has to be followed, moving first the twin arrows to the "In" channel, to obtain the following page:

The "Function" field allows to display the 0 and full scale % parameters with a linear or square relation according to the type of transmitter to be tested.

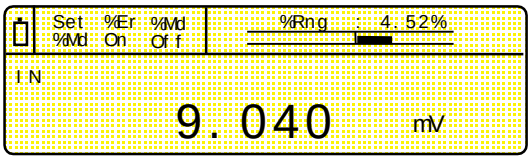
The **<% Err mod>** field allows to select the method for error calculation as "% of **F**ull **S**cale" or "% of the Reading" when the display of the "% Md input" is enabled and when the display of "% **Er**ror" instead of "% of **r**a**nge**" has been selected.

- Press the **<% Md On>** either on **IN**put or **OUT**put channel to obtain a bar graph display that indicates the percentage of the range actually measured or simulated.

The **OUT**put indication will be as it follows:



The **IN**put indication will be as it follows:



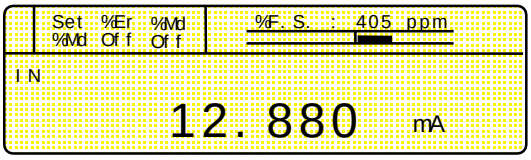
- To test the transmitter accuracy press the **<% Err On>** key to enable the computation and the display of the error in the **IN**put as a function of the simulated value referred to the **OUT**put value.

The "% Err" will be indicated as % of F.S. or % of Rdg according to the previous selection.

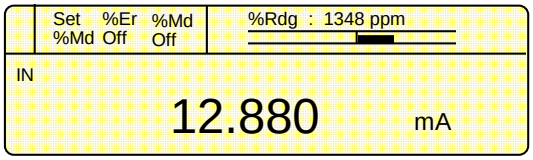
Example:

Setting a simulation output signal equivalent to 30% of the range a 30% of the input signal has to be found and measured.

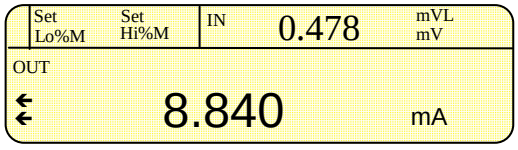
Enabling the "% Err" the error shown by the transmitter at that specific test point will be displayed eg. as it follows:



In the above page the error is indicated as "%of the full scale". If the error indication as "% of the reading" has been selected the displayed page will be the following:



When the Percentage Mode has been enabled press the **<MENU>** page to obtain the following indication:



Press one of the above new keys to adjust automatically respectively the 0% value and the 100%value to the actually indicated **IN**put and **OUT**put signal values.

I. OPTIONS & ACCESSORIES

I.1 External printer

The instrument can be supplied, on request, with an external printer cat. BB490001 (Option Table C = 4).

The above printer is a 58 mm standard paper impact type printer to document measured or simulated values, memory stored data and to generate calibration report of instruments under test.

The printer is directly powered from **Calys 1000/1200** and **Calys 1500** through the back panel 9 pole connector and incorporates its own microprocessor for digital signal handling and character generation.

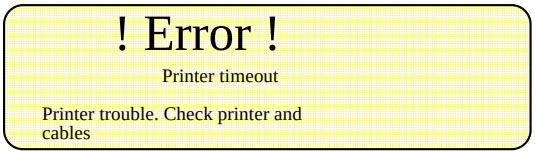
The printer module is supplied with cable and connector for a direct wiring to **Calys** with the following pinout:

pin 1
pin 2 5 V
pin 3 Ground
pin 4
pin 5 RX
pin 6 TX
pin 7
pin 8
pin 9

As the communication between the instrument and the printer uses a dedicated protocol no other printer can be used instead of cat. BB490000.

I.1.1 General recommendation

- The impact type printer operation requires a high power therefore the battery discharge process is accelerated limiting the operation autonomy.
- When a battery operation print is planned provide for a full charge of the battery .
- A low level of the battery charge will cause the instrument to be automatically switched -Off- when the "Print" instruction is given.
- When high precision measurements or simulations are required wait minimum for 30 s after each printout.
- The display backlight will automatically switch -Off- at the printer start to reduce the overall power.
- When a "Print" instruction is given press any key to stop. The printed report will show the message "...cancelled" indicating the operator's stop instruction.
- Press the **<Adv On>** key for the chart advance and then the **<Adv Off>** key to stop.
- If the printer is not running check the cable and connector.
- If the "Busy" signal from the printer persists for 5 s or more the following message will be displayed:

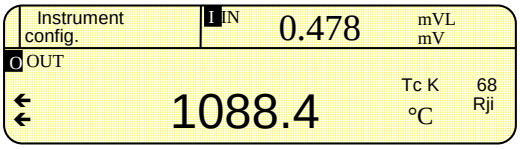


- Press any key to acknowledge the warning message

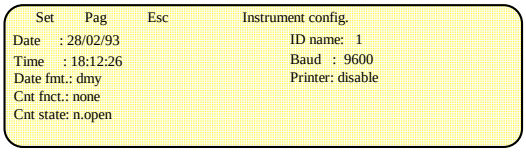
I.1.2 Printer operations: General

The printer operation can be enabled through the instrument general configuration procedure (see par.8.5)

With the instrument is operative in any mode press the **<MENU>** key several times to obtain the following indication:



- Press one of the **< Instrument Config >** keys to obtain the following indication.



Press the **<🔘>** or **<●>** key to select the "Printer" parameter

Press the **<Esc>** key to enter the mode selection

Press the **<🔘>** or **<●>** key to change from "Disable" to "Enable" or vice versa.

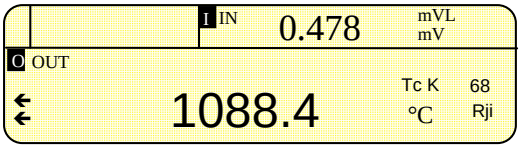
Select "Disable" when the printer operation is not required or the printer not available.

Press the **<ENTER>** key to acknowledge and memory store the printer mode

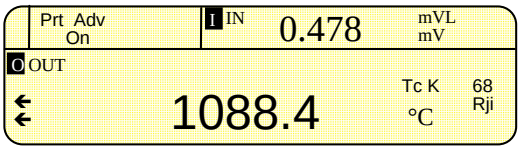
Press the **<Esc>** key to return to the normal operative mode

I.1.3 Printer operation: Normal In-Out mode

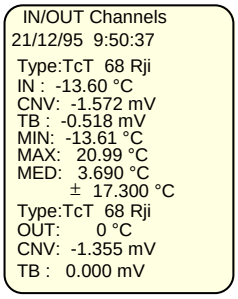
- Select the required operative mode with eg the following indication:



– Press the **<MENU>** key several times to obtain the following indication:



– Press the **<Adv On>** key to start the chart advance, if required.
– Press the **<Adv Off>** key to stop the chart advance
– The **<Set>** key is only used for special printout requirements not installed on standard instruments.
– Press the **<Prt>** key to obtain a printout as for the example shown below

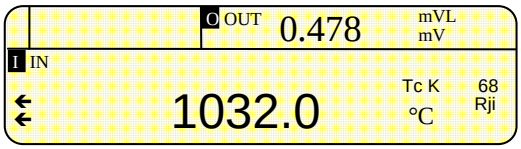


The time and date will be printed only if the real time clock, included in the option Table A =1, has been installed.
Error messages, if there are any, will be printed as a last line in the "Out" mode or instead of the measured value in the "In" mode".

I.2 Data Logging function

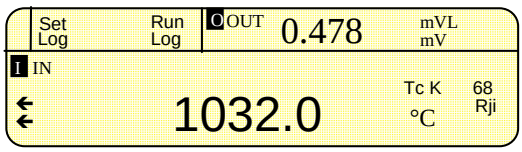
This operative mode is enabled only when the battery back up option (see table A=1 or A=2 on par. 1.2) of the memory has been installed.
The **Calys** indicator-simulator is equipped with an internal memory to perform a data acquisition function at programmable time intervals.
The memory has a capacity of 1500 data record.
Logged data are structured in groups, one single group contains the data measured and stored from each -RUN Log- and -End Log- operator's instructions.
The operative mode of the Data Logging option is described in the following procedure.

– Switch the instrument **<ON>**
– Select the required operative mode (e.g. for temperature measurement with thermocouple type K - IPTS 68) as indicated at par. 8.4.2 and 8.4.3.

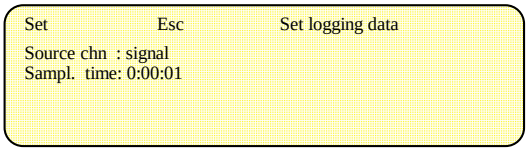


Remember that the opening of input terminals will cause a fluctuation of the reading up to "Underrange" or "Overrange" conditions.

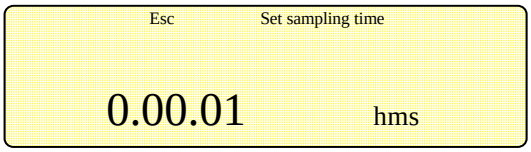
– Press the **<MENU>** key several times to obtain the following indication:



– Press the **<Set Log>** key to enter the page of logging parameters, obtaining the following indication:



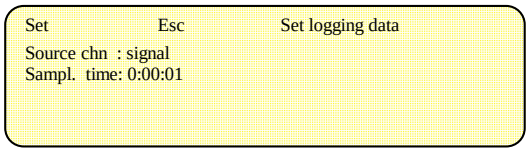
– Press <⓪> and <❶> keys to select the required parameter to be modified (e.g. "Sampling time" = interval time between two subsequent data acquisitions).
– Press the **<Set**> key to enter the page of the parameter adjustment e.g. as it follows:



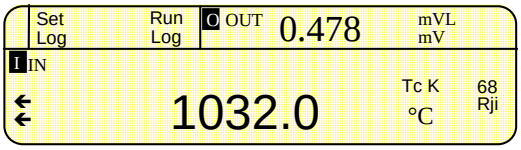
Any setting from 00 (h).00 (m).01 (s) to 12 (h).00 (m).00 (s) is accepted.

– Press the **<ENTER>** key to memory load the new sampling time or the **<Esc>** key to keep the previous setting.

The instrument will return to the indication:



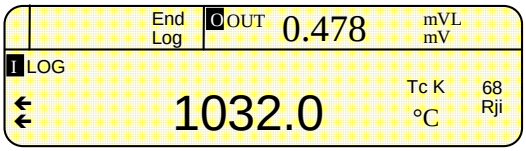
- Use the same procedure to set the additional parameters that are relevant to the graph operative mode.
- Press the **<Esc>** key twice to return to the normal operation page:



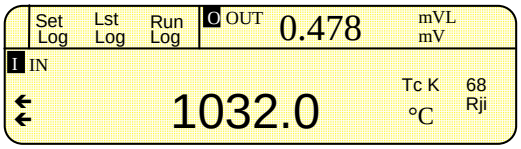
- Press the **<Run Log>** key to start the data acquisition program.

  The instrument will memory store the measured value at the end of each programmed time interval.

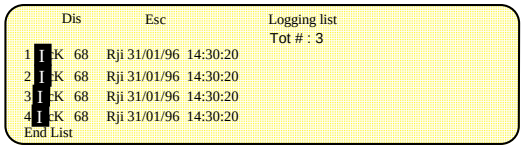
  The operative mode is announced with the "Log" message on the left of the display.



- Simultaneously with each data acquisition, instead of the "LOG" symbol, the indication "***" will appear, for few seconds, pointing out that the data acquisition is running. The data acquisition program ends automatically after 1500 data records or on the operator's instruction using the <End Log> key and the display will show the following indication:

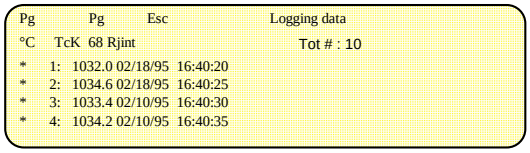


- The operator can review each memory cell content.
- Press the **<Lst Log>** key to review memory stored data with e.g. the following indication:



The above page shows that n.3 groups of data are memory stored

- To review the content of each group press the **<⓫>** or **<⓬>** key to select the required group
- Press the **<Dis>** key to obtain all data relevant to the selected group as indicated in the following figure.



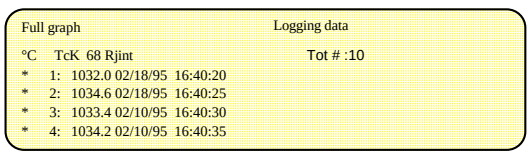
The above page indicates that 10 records were memory stored and that the sampling time was set at 5 s.

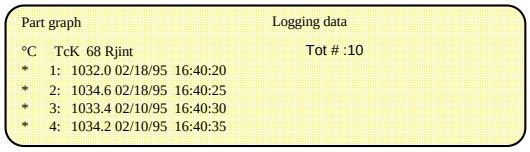
- The scanning can be per page using the **<Pg ⓫>** or **<Pg ⓬>** key.
- Additional instructions can be obtained using the following keys:

Gos	Go to start data (press first the **<Menu>** key to obtain this key indication)
Got	Go to end data (press first the **<Menu>** key to obtain this key indication)
Esc	Return to the previous page
Got	To select the required memory stored data
<ENTER>	Return to the previous page

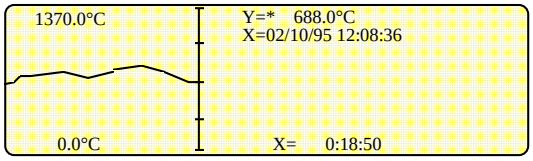
When the above page is displayed the operator can obtain a full or partial graph following the procedure indicated below:

- Press the **<Menu>** key to obtain the required mode with the following indication:

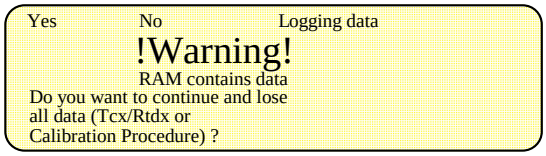




– Press the **<Full graph>** or **<Part. graph>** key to obtain e.g. the display of the graph of the memory stored values.



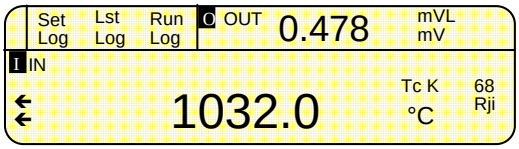
– Press the <⟲> key to return to the page listing the stored data and the **<Esc>** key to return to the normal operation page.
– If you need to start a further data logging press the **<Run Log>** key obtaining the following warning message:



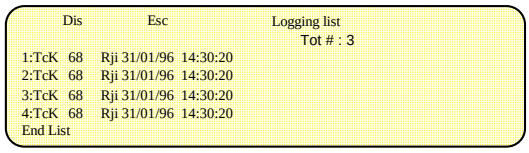
– Press the <**Yes>** key to cancel previous memory stored data and to start a new data logging or press the **<No>** key to cancel the previous instruction.

I.2.1 Printout of memory stored data

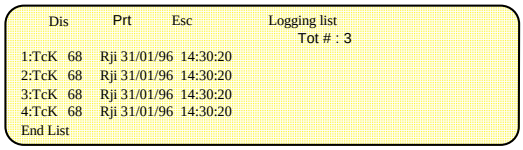
The availability of the optional external printer (option Table C =4) allows the preparation of a full report of all memory stored data.
See general recommendation and printer "Enable" set-up at par. 8.7.
The procedure starts from the end of the data acquisition program with the following indication:



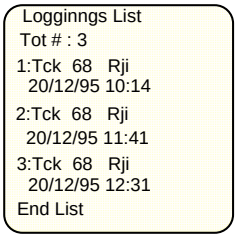
– Press the **<Lst Log>** key to display the memory stored data with e.g. the following indication:



– When the printer is enabled (see instrument configuration procedure) a key **<Prt>** will be also displayed as it follows



– Press the **<Prt>** key to obtain a printout of a memory stored group



The same procedure should be used to select first required groups and then to obtain the group content printout as, for exemple, it is shown below:

```
Logginngs Data
Type: tck  68 Rji
Tot#: 10
      1: -13.58 °C    C
        20/12/95 12:31:32
      2: -13.58 °C    C
        20/12/95 12:31:33
      3: -13.59 °C    C
        20/12/95 12:31:34
      4: -13.59 °C    C
        20/12/95 12:31:35
      5: -13.58 °C    C
        20/12/95 12:31:36
      6: -13.59 °C    C
        20/12/95 12:31:37
      7: -13.59 °C    C
        20/12/95 12:31:38
      8: -13.59 °C    C
        20/12/95 12:31:39
      9: -13.59 °C    C
        20/12/95 12:31:40
     10: -13.59 °C   HC
        20/12/95 12:31:41
End Log
```

- If required press any key to stop the printer. A message "...cancelled" will appear on the report indicating a print stop requested by the operator.

  The example shows an acquisition at 1 minute intervals.

  The date and time will be printed only if the real time clock, included in the option Table A =1, is installed.

I.3 PM200 Pressure Module

Calys PM200 Pressure Module is designed to be connected to standard Calys 1000/1200 or Calys 1500 realizing a portable, compact, rugged and accurate multifunction calibration system (Calys PM200 System).

When the PM200 is correctly installed, the symbol "⚇" shown on the main operative page.

The Pressure Module has been developed using a microcontroller technique to combine high flexibility of performances with a special procedure of calibration using computerized methods and storing into memory the relevant calibration data.

The relative / differential pressure measurement uses a temperature compensated silicon piezoresistive transducer individually characterized for linearity and temperature coefficient.

The individual sensor temperature / linearization matrix data are stored in a non-volatile EEPROM resident in the module.

In order to make the calibration activity easy the **PM200 System** can be specified with an internal single or twin pressure transducer up to 20 bar and, as an option, with a built-in hand pressure pump, a volume adjuster for fine control, a ventilation valve for pressure release and a pressure port.

As it is important that the maximum pressure for the device under test is not exceeded, a safety LIMITS function may be selected to automatically block the pumping action at the desired set pressure.

An external pressure transducer can be connected for pressure up to 700 bar.

The case made in Aluminium, has the front panel extremely rugged if you install the 20 bar built-in hand pressure pump.

The Pressure Module is powered by the Ni-Cd rechargeable batteries installed in the Calys .

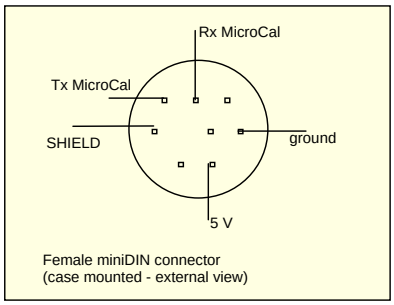
Please, refer to the instructions manual for the operator's procedures.

J. DIGITAL INTERFACE

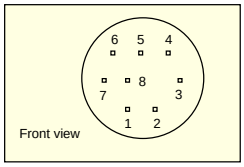
Calys is equipped with a digital interface at TTL level to allow communication with a Personal Computer. A normal or galvanic insulated TTL to RS232 adaptor is available on request. To set the communication parameters see the procedure in the par. 8.5.

J.1 Digital output wiring practice

The wiring to digital output signals is made through a mini DIN connector mounted on the lower end of the case.
The pertinent connections are indicated below :



For easy interconnections a miniDIN connector with cable con be supplied on request.
The conductors color codes can change with different supplier; please check before using.

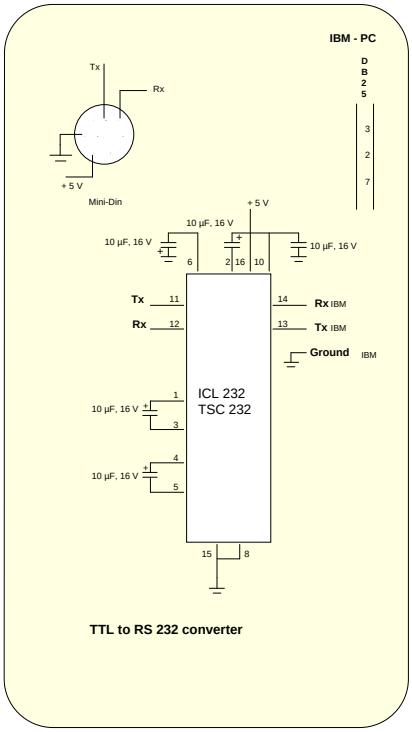


	LINDY	CINCH
pin 1 :	brown	black
pin 2 :	red	green
pin 3 :	green	blue
pin 4 :	gray	gray
pin 5 :	purple	yellow
pin 6 :	blue	white
pin 7 :	orange	red
pin 8 :	yellow	brown

J.1.1 TTL to RS232 adaptor

The TTL to RS232 adaptor consists of a cable to which are connected a male mini DIN connector (for the **Calys**) and a DB 25 connector, that contains the electrical circuitry (for the PC).

The basic circuit and connections are as follows:



J.2 Communication protocol from Calys to a PC

The exchange of information when a **Calys** is connected with a PC is as it follows:

J.2.1 Computer data request from Calys

Computer		**Calys**	
Tx IDNAME	→	Rx IDNAME	Proceed if name acknowledged
Rx IDNAME	←	Tx IDNAME	If not, do not answer
Tx Instruction	→	Rx Instruction	
Rx Instruction	←	Tx Instruction	
Tx char	→	Rx char	
Rx DATA 1	←	Tx DATA 1	
Tx char	→	Rx char	
Rx DATA 2	←	Tx DATA 2	
Tx char	→	Rx char	
Rx DATA 3	←	Tx DATA 3	
Tx char	→	Rx char	
Rx DATA 4	←	Tx DATA 4	
Tx CHKSUM	→	Rx CHKSUM	
Rx CHKSUM	←	Tx CHKSUM	

IDNAME, Instruction, DATA 1, DATA 2, DATA 3, DATA 4 and CHKSUM are 8-bit decimal values.

Tx CHKSUM = DATA1 + DATA2 + DATA3 + DATA4 .AND. 7F

Rx CHKSUM (checksum) = DATA1 + DATA2 + DATA3 + DATA4 .AND. FF

The above is useful to verify correct received data.

The minimum time-out of **Calys** is 3 seconds.

Reading values

00 - Actual I/O type ----------RX

0 I/O TYPE
1 I/O SUBTYPE
2 I/O FLAGS_IO (H)
3 I/O FLAGS_IO (L)

01 - Electrical Input value (invalue-final) ----------RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

02 - Actual engineering unit ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)

2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

05 - Output value (outvalue-final) ---------- RX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

06 - Pure Electrical Input value (invalue-pure/FATT) ---------- RX (Cnv)

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

07 - Pure Output value (outvalue-pure/FATT) ---------- RX (Cnv)

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

08 - Actual pure I/O type ---------- RX (Cnv)

0 I/O TYPE
1 I/O FACTOR
2 I/O FLAGS - IO (H)
3 I/O FLAGS - TO (L)

09 - Actual pure engineering unit ---------- RX (Cnv)

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

0A - Max Electrical input value (invalue_max) ---------- RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

0B - Min Electrical input value (invalue_min) ---------- RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

0C - Mean Electrical input value (invalue_med) ---------- RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

0D - Deviation Electrical input value (invalue_scost) ---------- RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

0E - Battery voltage ---------- RX

0
1
2 VBATT (H)
3 VBATT (L)

10 - Flags 2 ---------- RX

0
1
2 errout_global
3 -

15 - Date ---------- RX

0 DAY
1 MONTH
2 YEAR
3 -

16 - Time ---------- RX

0 HOURS
1 MINUTES
2 SECONDS
3 -

1A - Actual offset value (value_offset) ----------RX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

1C - Firmware version----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

1E - Actual internal Rj (rj_int - 2 decimals) ----------RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

1F - Actual external Rj (rj_ext - 2 decimals) ----------RX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

20 - Remote Rj (rj_rem - 2 decimals)----------RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

21 - Pure linearization Input value (invalue_puretab/FATT) ----------RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

22 - Pure linearization Output value (outvalue_puretab/FATT)----------RX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

2F - Actual selection ----------RX

0 Actual I/O channel (0 = OUTPUT - 1 = INPUT - 2=PRESSURE)
1 Actual slot display (0=Lower - 1=Upper)
2 I/O Channel for lower slot
3 I/O Channel for upper slot

30 - Serial number ----------RX

0 VALUE (H)
1 VALUE (L)
2 -
3 -

31 - Actual decimals number ----------RX

0 Displayed decimals
1 Pure signal decimals
2 -
3 -

32 - Calibrator ID (Calys 1000 = 9 - Calys 1200 = 11 - Calys 1500 = 14)-RX

0 Instrument ID
1 Instrument ID
2 Instrument ID
3 Instrument ID

33 - Pulse timebase OUT ----------RX

0 HOURS
1 MINUTES
2 SECONDS
3 -

34 - Pulse mode OUT ----------RX

0 flag_pulse (H)
1 flag_pulse (L)
2 -
3 'X' (ASCII CODE)

35 - Pulse timebase IN ----------RX

0 HOURS
1 MINUTES
2 SECONDS
3 -

36 - Pulse mode IN ----------RX

0 flag_pulse
1 flag_pulse (L)
2 -
3 -

3C - Firmware version----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

3D - Boot loader firmware version----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

40 - Flags X1 scaling OUT ----------RX

0 flag_x (H)
1 flag_x (L)
2 SUBTYPE
3 -

41 - Flags X2 scaling OUT ----------RX

0 flag_x (H)
1 flag_x (L)
2 SUBTYPE
3 -

42 - Flags X3 scaling OUT ----------RX

0 flag_x (H)
1 flag_x (L)
2 SUBTYPE
3 -

43 - Flags X4 scaling OUT ---------- RX

0 flag_x (H)
1 flag_x (L)
2 SUBTYPE
3 -

44 - Flags X5 scaling OUT ---------- RX

0 flag_x (H)
1 flag_x (L)
2 SUBTYPE
3 -

45 - Engineering unit X1 scaling OUT ---------- RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

46 - Engineering unit X2 scaling OUT ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

47 - Engineering unit X3 scaling OUT ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)

3 'X' (ASCII CODE)

48 - Engineering unit X4 scaling OUT ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

49 - Engineering unit X5 scaling OUT ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

4B – Auxiliary channel config ----------RX

0 Ch setting (0=none 1=Humidity)
1 Ambient Temp. Tecnical Unit (0= °C 1= °F 2= K)
2 -
3 -

4C – Humidity measurements----------RX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

4D – Ambient temperature measurements ----------RX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

50 - Flags X1 scaling IN ----------RX

0 flags_x (H)
1 flags_x (L)
2 SUBTYPE
3 -

51 - Flags X2 scaling IN ----------RX

0 flags_x (H)
1 flags_x (L)
2 SUBTYPE
3 -

52 - Flags X3 scaling IN ----------RX

0 flags_x (H)
1 flags_x (L)
2 SUBTYPE
3 -

53 - Flags X4 scaling IN ----------RX

0 flags_x (H)
1 flags_x (L)
2 SUBTYPE
3 -

54 - Flags X5 scaling IN ----------RX

0 flags_x (H)
1 flags_x (L)
2 SUBTYPE
3 -

55 - Engineering unit X1 scaling IN ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

56 - Engineering unit X2 scaling IN ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

57 - Engineering unit X3 scaling IN ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)

3 'X' (ASCII CODE)

58 - Engineering unit X4 scaling IN ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

59 - Engineering unit X5 scaling IN ----------RX

0 'X' (ASCII CODE)
1 'X' (ASCII CODE)
2 'X' (ASCII CODE)
3 'X' (ASCII CODE)

5A - Number of logging groups----------RX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

5B - Internal Rj OUT (rj_int - 2 decimals) ----------RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

5C - Internal Rj IN (rj_int - 2 decimals) ----------RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

61 - First recorded value of switch test routine ---------- RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

62 - Second recorded value of switch test routine---------- RX

0	VALUE (HH)	or	0x7f (denotes error)
1	VALUE (H)	-	
2	VALUE (L)	-	
3	VALUE (LL)	or	Error code

The Computer must combine HH - H - L - LL 8-bit wide each in a 32 bit long word value as it follows:

$V32 = HH * 2^{24} + H * 2^{16} + L * 2^{8} + LL$
IF $V32 >= 2^{31}$ then $V32 = V32 - 2^{32}$

or the H and L 8-bit wide each in a 16-bit word value as it follows:

$V16 = H * 2^{8} + L$
IF $V16 >= 2^{15}$ then $V16 = V16 - 2^{16}$

I/O TYPE or CNV TYPE

0	=	mVL
1	=	mVH
2	=	V
3	=	mA
4	=	Ω
5	=	KΩ
6	=	Hz
7	=	pulse
8	=	Tc
9	=	Rtd
10	=	X scaling

I/O SUBTYPE

(for I/O TYPE = 8)			(for I/O TYPE = 9)			(for I/O TYPE = 10)	
0	=	Tc J	15	=	Pt 100 IEC/DIN	0 =	X1 scaling
1	=	Tc K	16	=	Pt OIML	1 =	X2 scaling
2	=	Tc T	17	=	Pt USLAB	2 =	X3 scaling
3	=	Tc F	13	=	Pt US	3 =	X4 scaling
4	=	Tc R	19	=	Pt SAMA	4 =	X5 scaling
5	=	Tc S	20	=	Pt JIS		
6	=	Tc B	21	=	Pt 200		
7	=	Tc U	22	=	Pt 500		
8	=	Tc L	23	=	Pt 1000		

9	=	Tc N	24	=	Pt 1000 OIML
10	=	Tc E	25	=	Ni 100
11	=	Tc C	26	=	Ni 120
12	=	Tc G	27	=	Cu 10
13	=	Tc D	23	=	Cu 100
14	=	Tc X	29	=	Rtd X

I/O FLAGS_IO

(FLAGS_IO) .AND. 3	0	=	Rj internal
	1	=	Rj external
	2	=	Rj remote
(FLAGS_IO) .AND. 4	0	=	ITS 68
	1	=	ITS 90
(FLAGS_IO) .AND. &18	0	=	°C
	1	=	°F
	2	=	K
(FLAGS_IO) .AND. &20	0	=	4 w (for □□and k □ IN)
	1	=	3 w (for □ and k □ IN)
(FLAGS_IO) .AND. &C0	0	=	0 dec Tc/Rtd
	1	=	1 dec Tc/Rtd
	2	=	2 dec Tc/Rtd
(FLAGS_IO).AND. &300	1	=	1 dec Hz
	2	=	2 dec Hz
	3	=	3 dec Hz

IF Measure (HH) or Inp CNV (HH) or Max (HH) or Min (HH) or Med (HH) or Dev (HH) or Bar (HH) or Rj int (HH) o Rj rem (HH) =7 F (HEX) then the corresponding value LL represent the error code: (Also for errout_global)	0	=	None
	1	=	Overrange
	2	=	Underrange
	3	=	Rj err. (high)
	4	=	Rj err. (low)
	5	=	Calc. err.
	6	=	******
	7	=	Overflow
	8	=	Underflow
	9	=	Measure waiting
	10	=	Overvoltage
	11	=	Overcurrent
	14	=	Zero err.
	15	=	Frq. err.

"X" represents the ASCII code of the corresponding character, for the following characters, you must apply the conversion table, as shown:

Calys 1xxx	**PC**
128<---------->	248
129<---------->	234
130<---------->	230
131<---------->	24
132<---------->	25
133<---------->	224

(FLAGS_PULSE).AND. 1	0	=	Continuous
	1	=	One - shot
(FLAGS_X).AND. 7	(0 - 5)	=	x scaling decimals
(FLAGS_X).AND. 8	0	=	Linear
	1	=	Square
(FLAGS_X).AND. & 30	(1 - 3)	=	Pure signal decimals (for Hz)

V bat must be divided by 100 and represents the battery voltage with 2 decimals.
YEAR represents the year between 00-99.
Rj int, ext and rem represent the reference junction values in °C and must be divided by 100.

J.2.2 Computer data setting from PC to Calys

Computer		Calys	
Tx IDNAME	→	Rx IDNAME	Proceed if name acknowledged
Rx IDNAME	←	Tx IDNAME	If not, do not answer
Tx Instruction	→	Rx Instruction	
Rx Instruction	←	Tx Instruction	
Tx DATA 1	→	Rx DATA 1	
Rx char	←	Tx char	
Tx DATA 2	→	Rx DATA 2	
Rx char	←	Tx char	
Tx DATA 3	→	Rx DATA 3	
Rx char	←	Tx char	
Tx DATA 4	→	Rx DATA 4	
Rx char	←	Tx char	
Tx CHKSUM	→	Rx CHKSUM	
Rx CHKSUM	←	Tx CHKSUM	

IDNAME, Instruction, DATA 1, DATA 2, DATA 3, DATA 4 and CHKSUM are 8-bit decimal values
CHKSUM (checksum) = DATA1 + DATA2 + DATA3 + DATA4 .AND. 7F
The **Calys** receives and verifies the checksum, when not valid, it doesn't accept the data transmitted. The minimum time-out of the **Calys** is 3 seconds.

Writing values

80 - Actual I/O type ----------TX

0 I/O TYPE
1 I/O SUBTYPE
2 I/O FLAGS_IO (H)
3 I/O FLAGS_IO (L)

81 - Output value (outvalue_final) ----------TX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

82 - Actual selection ----------TX

0 Actual I/O slot display (0=Lower - 1=Upper)
1 -
2 -
3 -

83 - Date----------TX

0 DAY
1 MONTH
2 YEAR
3 -

84 - Time ----------TX

0 HOURS
1 MINUTES
2 SECONDS
3 -

85 - Reset Max,Min and Input filter ----------TX

0 -
1 -
2 -
3 -

87 - States control ----------TX

0 Offset state (0=OFF - 1=ON - 2=ON on degrees for Tc /Rtd - 255 = Don't modify)
1 Avg. state (0=OFF - 1=ON - 255 = Don't modify)
2 Hold state (0=OFF - 1=ON - 255 = Don't modify)
3 Set LOIN-HIIN (1=SET LoIN - 1=Set HiIN - 255 = Don't modify)

88 - Filter weight ----------TX

0 Filter weight (1-255)
1 -
2 -
3 -

89 - Function control ----------TX

0 Output function (0=OFF Autoramp,Autoscan,Trx - 1=Start Autoscan - 2=Start Autoramp - 3=Start Trx 255 = Don't modify)
1 Input function (0=OFF Logging - 1=Start Logging - 255 = Don't modify)
2 I/O function (0 = OFF One-shot - 1 = ON One-shot - 255 = Don't modify)

3 -

8A - Store memory ----------TX

0 Channel (0=OUT - 1=IN - 2=INP)
1 Memory number (0-19)
2 -
3 -

8B - Recall memory ----------TX

0 Channel (0=OUT - 1=IN - 2=INP)
1 Memory number (0-19)
2 -
3 -

8E - Actual states control 2 ----------TX

0 Autorange state (0=Off - 1=On - 255=no modify)
1 -
2 -
3 -

8F - Reset display error numbers----------TX

0 -
1 -
2 -
3 -

99 - Reset Output value----------TX

0 -
1 -
2 -
3 -

9A - Actual external Rj (rj_ext - 2 decimals)----------TX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

9B - Pulse timebase OUT ----------TX

0 HOURS
1 MINUTES
2 SECONDS
3 -

9C - Pulse mode OUT ----------TX

0 flag_pulse (H)
1 flag_pulse (L)
2 -
3 -

9D - Pulse timebase IN----------TX

0 HOURS
1 MINUTES
2 SECONDS
3 -

9E - Pulse mode OUT----------TX

0 flag_pulse (H)
1 flag_pulse (L)
2 -
3 -

9F - Reset recorded values of switch test routine ----------TX

0 -
1 -
2 -
3 -

C5 - Scroll / Swap selecting----------TX

0 Mode (0=Swap - 1=Scroll)
1 -
2 -
3 -

F2 - Reset instrument ----------TX

0 -
1 -
2 -

3 -

F3 - Power off instrument ----------TX

0 -
1 -
2 -
3 -

F4 - Set baut rate by instrument table----------TX

0 VALUE(0=OFF,1=300,2=600,3=1200,4=2400,5=4800.6=9600,7=19200,8=38400,9=57600,10=115200)
1 -
2 -
3 -

F5 - Set baut rate directly----------TX

0 VALUE (HH)
1 VALUE (H)
2 VALUE (L)
3 VALUE (LL)

The computer must split a 32 bit long word into 4 bytes of 8 bit as it follows:
Bits 31-24 --> HH
Bits 23-16 --> H
Bits 15-8 --> L
Bits 7-0 --> LL

IN/OUT selection	0	=	Select 0utput channel
	1	=	Select Input channel
OFFS	0	=	Off Offset
	1	=	On Offset
	2	=	On on degrees
	255	=	Don't modify
AVG	0	=	Off
	1	=	On
	255	=	Don't modify
HOLD	0	=	Off
	1	=	On
	255	=	Don't modify
XSCAL	0	=	Set the Low value as the actual value on the display in INPUT mode
	1	=	Set the High value as the actual value on the display in INPUT mode
	255	=	Don't modify
FUN Output	0	=	Off - Autoramp or Autoscan or TRX
	1	=	Start Autoscan
	2	=	Start Autoramp
	3	=	Start TRX
	255	=	Don't modify
FUN Input	0	=	Off Logging
	1	=	Start Logging
	255	=	Don't modify
FUN I/O	0	=	OFF One shot
	1	=	ON One shot
	255	=	Don't modify
MEM	Represents the memory number between 0÷19		
CHN	0	=	Store to OUT memories
	1	=	Store to IN memories

Actual Rj external the value must be multiplied by 100.

K. MAINTENANCE

The Calys portable calibrator has been factory tested and calibrated before shipment.

The calibration should be verified and re-adjusted if the instrument shows an error exceeding the declared specifications or when a critical active or passive component is replaced (either at component level or at board level)

AOIP sas will supply, on request, a technical reference manual, with all instructions and recommendations for service and calibration.

AOIP sas engineers will give prompt support for any request of assistance.

K.1 Faulty operating conditions

During the start up, measuring and simulation modes, faulty conditions of the instrument will be announced, with coded messages.

If the faulty condition is critical for the type of application, it is recommended to re-run the pertinent set up procedure.

All errors which cannot be recovered without the user's knowledge, result in some system action to inform the operator via a message, and where possible the system is restored.

Errors are classified thanks to the method by which they are handled. Recoverable errors report the error and then continue.

System errors which cannot be recovered cause the system to halt with a message displayed.

Restarting the instrument from -Power ON- may clear the error, but generally such messages are caused by hardware or software faults, which require the user's action.

After the start up diagnostic routine the presence of a fault in the system will be announced as it follows:

"Overrange"	In	Indicates an input signal higher than the acceptable level.
		Indicates an output signal setting higher than the acceptable level.
"Underrange"	In	Indicates a negative input signal lower than the acceptable.
		Indicates an output negative signal setting lower than the acceptable limit.
"Rj err. (high)"	In-Out	Indicates Rj int or remote temperature above the stated limit (+55°C or +100°C for remote))
"Rj err. (low)"	In-Out	Indicates Rj int or remote temperature below the stated limit (-10°C)
"Calc.err."	In-Out	Possible error during scale factor computation
"Overvoltage"	Out mA	Indicates a load resistance above the stated limits
"Overcurrent"	Other OUTs	Indicates a load resistance below the stated limits
"Overflw"	------	Indicates a numerical "overflow" conditions
"Underflw"	------	Indicates a numerical "underflow" conditions
"Frq.err."	In	Indicates that a too low or too high frequency is applied to the Input channel
"******"	In	Indicates that the Max, Min or Med values are meaningless
(measure wait)	In	This error number indicates that the measured circuit has been temporary halted
"Zero err"	In	Indicates that the internal autozero is out of range.
"P.S fail"	In	Indicates that the external load is too low in current loop measurement.
"No Avail"	In-Out	Indicates that the selected user's linearization is not available
"No module"	In	Indicates that the Pressure module PM200 is not connected.

K.2 Protection fuses

The instrument is protected by self limiting circuits and resettable fuses as it follows:

IN Mode (mV, V)

The input circuit is intrinsically protected up to 50 V (Tc and mV ranges)..

IN Mode (mA)

The input circuit is protected by the F5 (In) resettable fuse installed on the main board of the instrument.

IN Mode (Rtd)

The input circuit is intrinsically protected up to 5 V and by the two resettable fuses F4 and F6.

OUT Mode (V, mV)

The simulation circuit is protected by a current limiting device set at 2 mA.

In case of overcurrent, due to wrong external connections, the simulation circuit is also protected by the F2(Out) slow blow 100 mA fuse mounted on the main board.

OUT Mode (mA)

The simulation circuit is intrinsically protected by the impedance of the circuit and with the two resettable fuses F2 and F3.

OUT Mode (Rtd)

The simulation circuit is protected by a current limiting device up to 5 V.

In case of overvoltage, due to wrong external connections, the simulation circuit is also protected by F2(Out).

The protection is effective between terminals A and B or A and C or B and D.

Auxiliary power supply (In) (for mA)

The auxiliary power supply output is protected for a reverse voltage of 100 Vdc .

This circuit is also protected with a combination of a current limiting resettable fuse (F4).

Auxiliary power supply (Out) (for mA)

The auxiliary power supply output is protected from a reverse voltage of 100 Vdc .

This circuit is also protected by a combination of a current limiting resettable fuse (F3).

K.3 Safety recommendations

Primary elements (i.e. thermocouples, resistance thermometers, etc.) are normally linked to electrical potentials equal or near to the ground potential. However, in some applications, there may be present a common mode voltage to earth.

Check for voltage between input terminals and the ground, as this voltage can be transmitted to other devices connected to the calibrator.

K.4 Storage

If the instrument has been left unused for a long time, it is recommended to remove its batteries.

Store the instrument in the original package, at a temperature from -30°C to +60°C, with R.H. less than 90%.

If the instrument has been unused for a month check the battery voltage, and charge Ni-Cd batteries for at least 4 hours.

Returning

If the unit is to be returned, it is preferable to use the original packaging and state as clearly as possible, in a note attached to the unit, the reasons for its return.

AOIP SAS
Rue Dupont Gravé
F-14600 Honfleur

From France :
01.69.02.89.30
From your country :
+33(1) 69.02.89.50

Fax : +33(1) 69 02 89 60
Email : sav@aoip.com

Warning
The packaging supplied with the calibrator can withstand a maximum pressure of 20 bar at 21°C (290 psi at 70°F). Subjecting the package to a higher pressure risks damaging the unit.

K.5 EMC Conformity

The Pressure Module case is made in aluminium to fulfil the prevision of the directive 89/336/CEE Electromagnetic Compatibility.

The following page is a copy of the EMC declaration of conformity.

Declaration of Conformity

AOIP SAS
ZAC DE L'ORME POMPONNE
50-52 Avenue PAUL LANGEVIN
F-91130 RIS-ORANGIS

From France :

N°Azur 0 810 10 2647
PRIX D'UN APPEL LOCAL

01 69.02.89.88
From your country :
+33(1) 69.02.89.00

Fax : +33(1) 69 02 89 70

CE